COMPUTERWORLD

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NEWSPAPER

Xerox Departs Mainframe Scene

By E. Drake Lundell Jr.
Of the CW Staff

EL SEGUNDO, Calif. – "A sort of numbness" has settled over the people at what used to be the headquarters of Xerox Corp.'s Data Systems Division here.

"I can understand the idea that we're out of business on an intellectual level," one said last week, "but psychologically it hasn't set in yet."

At the same time, this is a period of rapid activity followed by immobility and inertia for the people here, who hope reports of a takeover come before their pink slips arrive.

People wander around, discussing contacts on the outside world, writing resumes and tying up the switchboard with calls to friends and potential employers outside the Xerox family.

And the headhunters have shown up. One marketing man already has had two offers and expects at least one more by the end of the week.

"Experience at Xerox is considered good training," another said, "so our marketing people should be in pretty good shape when it comes to landing another job."

One of the big problems facing the employees here is uncertainty over the future. Several operations are continuing here, and no one has been notified yet about whether they will be among those who stay.

And the rumors are rife. Some say the layoffs will amount to less than 1,000. But others label such speculation "nonsense," predicting it will be at least three times the number.

There had been no hint of the decision to discontinue operations at all, with the general information being that only four people on the West Coast knew of the planned announcement up to a week before it was made.

The rest of management found out about it in a meeting of all managers held while Xerox Corp. Chairman C. Peter McColough was simultaneously dropping the bomb in New York City for the outside world.

The managers were then faced with the task of informing their departments by reading a memo circulated by the company.

Some who were out sick on Monday didn't hear the news until they reported for work the next day.

At the same time, several insiders said last week the mood within the company had been "up" over the last six months. "We were doing better – at least we thought so," one said.

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Throwing in the Towel

By Molly Upton
Of the CW Staff

STAMFORD, Conn. – Xerox Corp.'s Data Systems Division threw in the computer mainframe towel last week, but the company will retain certain peripherals, terminals and its DP services business.

The move was described as purely a business decision and was obviously related to a drastic dip in second-quarter financial results. (See story on page 25.)

"Our mainframe operations have been uprofitable since 1970 and, after exhaustive studies, we have concluded that we cannot reasonably expect profitability from this stand-alone digital business for several more years at least and at considerable expense to the corporation," C. Peter McColough, chairman of parent Xerox Corp., said at a hastily summoned news conference at the close of the New York Stock Exchange on Monday, July 21.

"We have decided not to make substantial future investments in computer mainframes so we can devote our resources to the parts of our business which are more promising and profitable," he said.

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Special Report

IBM SNA Simplifies Teleprocessing Design

By John C. Broughton
Special to Computerworld

IBM's Systems Network Architecture (SNA) was developed to address teleprocessing problems similar to those the System 360 architecture addressed 10 years ago for batch processing.

A major problem in teleprocessing has been the increasing number and complexity of line controls, controllers, terminals and control programs.

If even one component of an existing application environment was changed – the type of terminal, for example – it was often necessary to redesign not only the control for that component, but the entire application.

As a decade earlier, a system architecture was needed to provide versatility of configurations, uniformity of protocols for IBM products, planned growth and orderly migration.

SNA is independent of device-specific characteristics or network configurations. It is adaptable to future as well as to existing products.

Instead of being designed around machines or programs, it is based on functions. Growth with an SNA architecture includes such benefits as easier installation, reduction of system programming by the user and improved efficiency and versatility.

SNA, like the System 360, is one of the possible solutions to a universal problem.

A system approach to teleprocessing is especially formidable because of inherent complications: the distances between components, the intervening communication facilities, the variety of types of communication links and the use of complex configurations.

A major turning point in communication systems has been the introduction of distributed function (made possible by cheaper and denser electronics of large-scale integration), which has brought such benefits as reduced use of communication lines and host computer, better terminal response and availability in case of network node or line failure.

System Network Architecture contains several types of nodes: host, communication controller, cluster controller and terminal. The host holds the centralized data base and monitors the resources of the network.

Communication controllers manage the communication lines and provide line er-

(Continued on Page 2)

CW Special Report on Data Terminals follows page 18.

Lear Siegler Sets Up Refund Pool To Reimburse Former Students

By Don Leavitt
Of the CW Staff

WASHINGTON, D.C. – Eligible former students of computer courses offered by Lear Siegler, Inc.'s (LSI) Education Division can receive pro rata tuition refunds from a $750,000 restitution fund set up last week by LSI under terms of a proposed agreement between the Federal Trade Commission (FTC) and the company.

The commission will accept public comments on the agreement until Sept. 10 and then decide whether to make it final.

The agreement settled a complaint filed against LSI that alleged the firm used unfair and deceptive methods to sell computer courses offered at its vocational schools across the country.

The FTC noted last week, however, that the agreement "is for settlement purposes only and does not constitute an admission by [LSI] that it violated the law."

At the time of the complaint, the FTC said there was no proof of an "urgent need" for the DP graduates of LSI, as the company claimed. The schools also failed to disclose the percentage of graduates who got jobs after training, the names of employers or the starting salaries.

At LSI headquarters in Santa Monica, Calif., the firm's president, Robert T. Campion, characterized the settlement as "the most expeditious way to dispose of the matter in light of the substantial costs involved in prolonged litigation."

In Cleveland, meanwhile, attorney Elaine R. Crane – who aided LSI – called the agreement "something of a bellwether" since it was negotiated after the FTC Improvements Act went into effect. That act extended the commisson's jurisdiction to cover activities "affecting commerce" and allowed it to sue complaint respondents to recover restitutionary amounts.

LSI is one of three major "computer school" proprietors against which the FTC brought complaints in the 1973-74 period. The settlement with LSI "might affect" cases against Control Data Institute and Electronic Computer Programming Institute (ECPI), according to attorney Mack Thornton of the commission's Bureau of Consumer Protection.

In New York, ECPI vice-president William Kalaboke declined comment, noting he had not yet reviewed the accord.

A spokeswoman for Control Data Institute in Minneapolis noted the FTC first published its charges against that institute's computer schools in May 1972. She said the company "has challenged those charges, defended itself in the invervening three years and continues to do so."

(Continued on Page 2)

CDC Hikes Memory, Disk Capacity On Top-of-Line Cyber 76 Series

By Patrick Ward
Of the CW Staff

MINNEAPOLIS – Control Data Corp. has doubled the basic memory size available on its top-of-the-line Cyber 76 series, boosted maximum disk capacity by 50% and improved the 76's compatibility for distributed processing with other CDC machines.

The Cyber 76-142 model contains 128K 60-bit words of bipolar semiconductor basic memory, CDC said. The previous maximum had been 65K of core on the Cyber 76-14 and 76-18 models.

CDC has changed both these models to semiconductor memory and renamed them the 121 and 122.

The two smallest Cyber 76 models, the 32K 12 and 14, have been dropped.

It is impractical to field upgrade previously all-core-memory Cyber 76s to semiconductor memory, CDC said. However, the 121 and 122 models can be field upgraded to a 142, it added.

The small semiconductor memory (SSM) is the basic memory in the CDC Cyber 76 series in that it is the location in which actual processing takes place. The Cyber 76 machines also have either 256K (the 121) or 512K (the 122 and 142) of large core memory which is auxiliary to the machine's basic semiconductor memory.

The addition of the 128K Cyber 76-142 should allow users to run larger programs,

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Computer Industry Editor	Molly Upton
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PRODUCTION

Manager	Lee Vidmer
Supervisor	Henry Fling

Please address all correspondence to the appropriate department at 797 Washington Street, Newton, Mass. 02160. Phone: (617) 965-5800. Telex: 92-2529.

OTHER EDITORIAL OFFICES: England: Computerworld Publishing Ltd., 140-146 Camden Street, London NW1 9PF. Phone: (01) 485-2248/9; Telex: 264737. W. Germany: Computerworld, c/o Computerwoche GmbH, 8000 München 40, Tristanstrasse 11. Phone: 36-40-36/37. Telex: 5215350. Asia: Computerworld, c/o Dempa/Computerworld Company, Dempa Building, 1-11-15, Higashi Gotanda 1-chome, Shinagawa-ku, Tokyo 141. Phone: (03) 445-6101. Telex: 26792.

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Boosts Disk Capacity 50%

CDC Doubles Cyber 76 Memory to 128K

(Continued from Page 1)

which should ease conversions from Cyber 72, 73 and 74 models and other machines with a single kind of memory, CDC said.

Additionally, the larger memory should allow the 142 to keep more programs immediately resident in the SSM, which should aid multiprogramming users, CDC said.

While the semiconductor memory is not significantly faster than the core basic memory it replaces, it allows for a "phased memory" technique that is said to allow independent reference of consecutive memory addresses.

This will reduce potential memory conflicts by allocating references among the SSM's 16 or 32 independent, phased memory modules.

The SSM also allows for greater data integrity by use of single-bit error correction, double-bit error detection logic, the firm said.

The semiconductor memory is more reliable than the core memory it replaces, CDC said.

The firm claimed its 7639/819 disk drive system will offer a 15% to 25% performance improvement at a price nearly 30% less than the mass storage disk file first used with the Cyber 76 series.

Each 819 storage unit holds 413 million characters of data on a fixed 22-disk pack.

The Cyber 76 Scope operating system currently supports up to three single-controller, two-drive subsystems, providing a maximum storage capacity of 2.4 billion 6-bit characters.

However, a CDC spokesman said he expects software support for 3.2 billion characters soon.

The previous 7638 system had offered a maximum of 1.6 billion characters of storage.

The 819 storage unit reads and records data stored at 6,000 bit/in. Data transfer to and from the Cyber 76 SSM takes places at 6.2 million char./sec, with an average access time of 50 msec.

Operating system releases announced with the hardware are said to enhance distributed processing by providing for staging of permanent files between Cyber 76s and/or between them and connected Cyber 70 processors.

Purchase, Lease Prices

The Model 76-121 costs $5,214,000 purchase or $103,950/mo on a three-year lease. Maintenance is $15,631/mo.

The 76-122 costs $6,622,000 purchase or $133,006/mo, with maintenance at $18,819/mo.

Purchase price for the 76-142 is $7,519,000, with a lease price of $152,076/mo. Maintenance is $21,919/mo.

The CDC 7639/819 controller and disk drive subsystem costs $180,000 or leases at $4,720/mo on a three-year contract. The maintenance charge is $420/mo.

Delivery of the Cyber 76 models and the disk subsystem will begin in the third quarter.

Lear Siegler Creates Refund Pool To Reimburse Former Students

(Continued from Page 1)

LSI has no current students since it sold in 1974 all 19 schools in which it offered courses in computer programming and/or operations.

Although both the commission and LSI have a reasonably good idea of how many students are entitled to refunds, actual distribution of the payments may be a long process.

"It is hard to say who is eligible under the criteria" spelled out in the agreement, Thornton acknowledged, adding that he would like to hear from former students who feel they might have legitimate claims.

To be eligible for a refund, a person must have been enrolled in one of the LSI schools between July 1, 1970 and December 31, 1973 and completed all the DP classes of the total course in which he was enrolled. Course and class completion within the 1970-73 period, however, is apparently not one of the criteria for eligibility.

The LSI student would have had to actively looked for work in data processing. This requirement is waived, however, if the student was told by the school's placement office that there was no way he could get a job or was told by a prospective employer that the course was not sufficient training for what should have been a reasonable starting position, Thornton said.

Finally, Thornton noted, a former student is ineligible for the refund if, "at any time since he got out of school," he has served in a job for which he was trained. Thus, a programming student who took an operator's job is eligible; but if he moves up to a programmer slot from operator, he loses eligibility.

Thornton said former students who feel they may qualify should contact him at the FTC, Room 282, here in Washington, 20580.

Systems Network Architecture Simplifies Teleprocessing Design

(Continued from Page 1)

ror recovery and switched network attachment services.

Cluster controllers and terminals provide operator access to the network through conventional I/O devices.

Cluster controllers, as the name indicates, control clusters of these devices and provide limited data file facilities.

SNA separates function into three logical layers at both ends of a communication link (Figure 1).

This separation has been aided by the use of Synchronous Data Link Control (SDLC), in which link control, the actual connection between physical elements, has been separated from network addressing and control.

The layers are further subdivided into finer functional elements. Paired elements in each layer, one at the origin and one

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Despite High Hopes, Xerox Now Part of DP History

By E. Drake Lundell Jr.
Of the CW Staff

EL SEGUNDO, Calif. – And then there was one less.

One less option for computer users, one less 'mainframe" maker, one less competitor in the computer industry, one less employer of computer people.

Xerox Corp. has folded its tent in the computer industry – the third failure of a mainframe computer manufacturer in five years – and crept back to what it does best.

The third major American firm to exit from the computer business during that time. Fortune 500ers all, RCA, General Electric (GE) and Xerox have now all become part of the history and not the future of the computer community.

Xerox was not as big a factor as RCA or GE, of course. But its hopes – and the hopes of many others in the field – had been high for its success when it entered the business in 1969 with the acquisition of Scientific Data Systems (SDS), a specialized and profitable computer producer.

Xerox had the muscle in terms of both manpower and capital, industry pundits said, to make a go of it in an industry where others had failed. And the pundits settled back to watch what they expected to be a major battle between two of the best marketing companies in the world, as Xerox took on IBM on its home ground.

SDS, founded by Max Palevsky in 1961, had made its mark in the scientific, educational, time-sharing and real-time computer markets.

It competed only to a very limited extent against the bastion of IBM strength, the business data processing market, preferring to be the big fish in a smaller pond.

With well-directed marketing aimed at a specific target, SDS became one of the major success stories of the 1960s, widely considered to have a bright future and high prospects.

In fact, many in the computer business thought first of the firm when they heard the initials "SDS," rather than the militant Students for a Democratic Society, sometimes leading to embarassing headlines.

Strength Misleading

But the strength of SDS in the late 1960s may have been somewhat misleading, particularly to the Xerox management looking for a way to jump headlong into the business data processing market as an adjunct to the other essentially business products it marketed.

At the time of the negotiations for the takeover of the firm by Xerox, SDS was riding a crest in terms of its market.

It was heavily into the space and defense industries and the scientific market for seismic processing, which were, to a large degree, peaking at the time.

In addition, Xerox was not content to stay in the market area in which SDS had been successful over the years.

"It wanted to be number two to IBM in the business data processing market," Dan McGurk, who was the last president of SDS and the first of Xerox Data Systems, recalled last week.

"Unfortunately," he added, "it also wanted to be profitable from the start."

Analysis

McGurk said that at first he felt it could be done and, when he felt a year later it was impossible, he and the new owners parted company.

"In retrospect," he said, "I think it could have done either, but not both at once. It could have been a successful, profitable company in the firm's traditional markets or it could have been successful in business data processing, if it had been willing to defer profits for the long run."

But, if there were weaknesses in the company overlooked by Xerox, they were also overlooked by everyone else in the business.

In the computer industry, marketing is the name of the game to a large extent, and industry pundits saw Xerox as a superb marketing organization ready to give everyone in the computer business, including IBM, a run for its money.

But it didn't work out that way.

In fact, however, the market share for the firm began to drop and not rise under the Xerox leadership, due in part, some said, to the head-to-head competition with IBM and in part of management mistakes within the company itself.

"I don't really think top management at Xerox ever understood the computer business or the commitment that would be necessary for success. Maybe they just found out and that's why they dropped out."

Xerox Takes Leave Of Mainframe Scene

(Continued from Page 1)

"If they'd dropped us a year ago, it wouldn't have been this much of a shock," another added. "But over the last year, we were finally making some progress."

Several new products have been introduced in recent months, these insiders said, and several more were slated in the near future.

Logical extensions to the Series 500 systems were well along, and some were even slated for announcement within a month or two of the decision to close down, one source said.

In addition, longer range extensions to that series were well along the development pipeline, with products slated for announcement for as much as two years in the future.

With all the products in the works, many in the company felt the division was at a high point, not a low.

In fact, the marketing department had been working on a new marketing approach and was developing a plan to try to sell the features of the 500 series better.

One top manager congratulated the group on its work, indicating he was "delighted" and that work should proceed on the new idea.

That was two hours before the ax fell.

The esprit de corps had also been up, with people believing in what they were doing, one insider said.

"That's what makes it hard," he added. "It's hard to leave something you believe in – and, damn it, we were close."

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Xerox Users Praise Equipment, Vow to 'Tough It Out'

By Molly Upton
And Nancy French
Of the CW Staff

Xerox computer users, although unhappy with the manufacturer's decision to exit from the computer business, generally are prepared to tough it out.

Few expressed any panic, most believed the machines are excellent and some said they were happy to live with the existing software.

Others, however, had taken precautions to make their installations as independent of their hardware supplier as possible, almost as if in anticipation of such a move.

One user said he was not so much surprised at the announcement that Xerox decided to leave the business as he was at the manner in which the news was announced.

Few indicated the move would affect their operations but most said the likelihood of upgrading to Xerox is now almost nil.

One user said he thought the base would be picked up by another manufacturer. "It will have to be. The equipment is so much better than IBM's," he said.

Ed Brewster, program instructor for the Greater Lowell (Mass.) Regional Vocational High School, which installed the first 560 in April, said "we'll have to ride with it right now."

The machine and CP/V software are excellent, he added.

Dr. Mel Rosenfeld, computer manager at Woods Hole (Mass.) Oceanographic Institute, said.

"I don't know what we're going to do with our Sigma 7." "We expanded the system greatly last April and had planned to keep the machine another four years, but now we just don't know, and it'll probably take months to decide."

At Michigan State University's Cyclotron Laboratory, Richard Au, computer manager, said, "I guess I knew it was going to do that.

"Just look at the company – it bought out Scientific Data Systems [SDS], milked the company dry. Then last year it brought out the 560 series that wasn't worth a darn. What a beautiful tax write-off."

Coincidentally, Au said he was already thinking of replacing the Sigma 7 with a new system two to four times more powerful. "We would have liked to have stayed with Xerox," he said.

Jim Reed, DP manager at Wayne (Mich.) Community College, called the announcement "catastrophic. Everyone's running around in circles here," he said.

"We bought a Sigma 7 less than two years ago and now it isn't worth anything on the open market," he pointed out.

Reed said he went through the same thing when RCA went under.

A Vanderbilt University spokesman said he was "disappointed because he thought the Sigma 7 was the best system we had ever had."

Although the university has maintenance engineers on its staff and two independent parts suppliers, it is "very concerned about software support. Outside of Xerox, there aren't too many places you can get software," he said.

Dave Nordby, manager of real-time systems at G.D. Searle Co. in Skokie, Ill., called the decision "disturbing. It means there is one less company to give an alternative to IBM."

"When you see one company go down the tubes, it doesn't help instill confidence in others," he noted.

Searle has a Sigma 3 and 530 used in a lab automation system to support research. The firm does most of its own software and has a maintenance contract, so Nordby doesn't anticipate being affected by the announcement.

"The hardware is good gear. It's a pity to see Xerox go under," he said.

If Xerox had exited a couple of years ago, the users would have been in much worse shape, he said, because they were then clamoring for improved software. But now users are generally happy with the operating systems, he said.

Bob Neth, manager of computer services at Cummins Engine Co. in Columbus, Ind., said he was unpleasantly surprised because he had "no inkling" anything was in the wind.

Cummins has had a Sigma 9, which performs scientific and engineering calculations as well as general-purpose time-sharing, since June 1974. Cummins has had Xerox equipment since 1971.

The news will certainly trigger changes, but it's too early to tell to what these will amount, he said.

Danny Carter, chairman of the computer science department at the University of Southern Mississippi in Hattiesburg, said, "We haven't jumped out of any windows," noting it is going to wait and see what Xerox's moves are going to be.

Carter said the university is very impressed with its Sigma 9, which was the best compromise around for both batch and time-sharing.

One user who has one Sigma 9, three 530s, and a 560 being installed said, "I've been a Xerox user for four or five years and I'm just sick about this whole thing. To me, Xerox is the only mainframe manufacturer that offers a real alternative to IBM.

"If they can't make it, I don't believe anyone will," he said.

"We've got another 560 on order, and as far as I'm concerned we're going to take it. We don't have enough information to make any other decision yet."

Two very large users, both time-sharing firms, each do their own maintenance and write their own systems software.

This was not so much luck as a carefully plotted plan to become as independent of suppliers as possible, Richard Crandall, president of Comshare, Inc., noted.

"We've looked upon Xerox as an iron supplier," he said, adding Comshare is currently evaluating independent peripherals.

Crandall said the Xerox move would not affect his firm's near-term plans because it has sufficient capacity to meet demands through 1976 and has ordered Xerox equipment that will carry it through 1977.

But he admitted that, when it comes time to switch to a new generation, the question of supplier will have to be addressed.

The firm has 10 of the Xerox 940s and six Sigma 9s in the U.S. and another five Sigma 9s outside the U.S., he said.

Looking at the situation in an "opportunistic manner, it appears there may be a number of mainframes on market at reasonable cost," he noted.

Thomas J. O'Rourke, president of Tymshare, Inc. said his firm hasn't been that close to Xerox for about four years, when it bought its 940s.

Tymshare does its own maintenance and has a division, Valcomp in Westlake Village, Calif., that provides parts and refurbishing for the Xerox Series 9 equipment.

Tymshare acquired the firm because "we wanted to protect ourselves when we bought our 27 940s," he said.

Tymshare wrote its system software for these machines, he said, as a legacy for the days back in 1966 when it polished up some software for the commercial market and sold it to SDS.

Xerox Throws in the Towel

(Continued from Page 1)

"Presently accepted orders for computer products will be filled. Commitments to customers under existing lease, purchase and service agreements will be honored, orders now in process and additional requirements for products also will be honored depending upon availability," McColough said.

Diablo, a subsidiary that makes printers, terminals and disk drives, will continue operations unchanged. Xerox will continue to manufacture the Model 1200 high-speed Xerographic printer in its plant in El Segundo, Calif.

Xerox is also keeping its computer services business, which is headquartered in Marina del Rey, Calif., and serves the Los Angeles, Chicago, New York and Dallas areas.

Xerox will approach potential buyers of Xerox Data Systems, McColough said after the press conference. The firm has about 1,700 systems installed in the U.S. and 400 abroad, a spokesman said.

When asked if it is thinking of acquiring any of the Xerox base or business, a Univac spokesman said the firm had no comment at the moment.

Xerox bought Scientific Data Systems (SDS) in 1969 for about $910 million. SDS was a relatively small but profitable firm then with a reputation for quality number-cruncher machines.

Its market share was estimated at 1%, but has since shrunk, McColough said.

With hindsight, "I can say that I wouldn't have acquired it at that price in 1969," he added.

The operation could have reached the break-even point by about 1980, but Xerox would have had to invest $150 million to $200 million to develop a new computer line, he observed.

Although it is phasing out manufacture of stand-alone systems, a Xerox spokesman indicated the technology is incorporated into several of its noncomputer products today and will be vital to the products it has planned for the business office now and in the future.

"Our ongoing computer-related activities will be important also," he added.

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Say They Can't Afford Them

States Blast NCIC Requirement for Dedicated Systems

By Nancy French
Of the CW Staff

WASHINGTON, D.C. – State governors and at least one attorney general have said "the Justice Department overstepped its bounds" in requiring dedicated computers for criminal justice information systems and have threatened to drop out of the Federal Bureau of Investigation's (FBI) National Crime Information Center (NCIC) because they simply can't afford the cost.

The Justice Department's recently published regulations calling for states receiving federal funding to operate computerized criminal justice information systems on dedicated computers rather than systems shared with other state departments [CW, June 11] has been called "the last straw" in federal encroachment into areas that fall under the states' constitutional responsibility.

State law enforcement agencies maintain and disseminate criminal history information and data on stolen property and wanted criminals in cooperation with the NCIC here.

State officials are fighting their battle on two fronts: first, through direct communication with U.S. Attorney General Edward H. Levi, and second – because many feel such appeals fall on deaf ears – with pleas to congressional committees now studying legislation to establish standards for handling criminal justice information.

Funding No Longer 'Bait'

In a letter to Levi, Minnesota Gov. Wendell R. Anderson questioned "the wisdom of the FBI as the sole authority in charge of security and privacy of criminal history record information.

"Surely, in the public mind, that is a classic example of directing the fox to guard the henhouse," Anderson wrote.

Using federal funding as "bait for giving up state sovereignty is not new," he said, but it is "no longer acceptable," particularly in this case where the funding is a very small part of the total systems cost.

"It remains an open question whether Minnesota will become part of the interstate Computerized Criminal History system," he said. As for dedication, Anderson called the concept "a spurious security and privacy issue."

Vermont Gov. Thomas P. Salmon called the Justice Department's attitude toward state sovereignty "cavalier" and contrary to state policies of consolidating DP services on larger and more cost-effective systems.

"Vermont pays tenfold for every dollar received from the Federal Government for criminal justice information systems. If federal program planners and managers insist on the states' obligating themselves for vast new expenditures to fit federal guidelines, it may be that many will have to drop out or reduce our participation," he said.

Illinois Gov. Dan Walker told Levi that states "should be free to determine the issue of dedicated computer privacy and security in terms of their economic impact without undue federal restriction."

Utah Gov. Calvin L. Rampton reminded Levi that the Justice Department failed to comply with an Office of Management and Budget rule requiring an inflationary impact statement before rules with a serious economic impact on state or federal agency budgets are issued.

Governors Groups Object

Both the National Governors' Conference (NGC) and the National Association for State Information Systems (Nasis) have sent Levi position papers opposing the new rules.

In addition, the NGC called for restructuring the NCIC Advisory Policy Board, which approved the rules and regulations before they were issued, and asked that the board be made responsible directly to the Attorney General rather than the director of the FBI.

The NGC pointed out that the NCIC Advisory Board, which is composed primarily of state and local law enforcement officials rather than representatives of the governor, state legislators or data management staff, "does not represent the concerns of governors and state administrators."

The NGC called for "citizen participants nominated by the governors" to be added to the NCIC board.

Speaking from what it called a "balanced" understanding of the problem, Nasis opposed dedicating computers to a single function on the basis of economics.

"Nasis is not objecting to any state's decision to dedicate a computer to criminal justice, however; Nasis is objecting to the attempt to force all 50 states to make those decisions . . . even though they may be contrary to statute or administrative regulations."

To date, Levi has not responded to any of his mail on the subject.

Capitol Hill Hearings

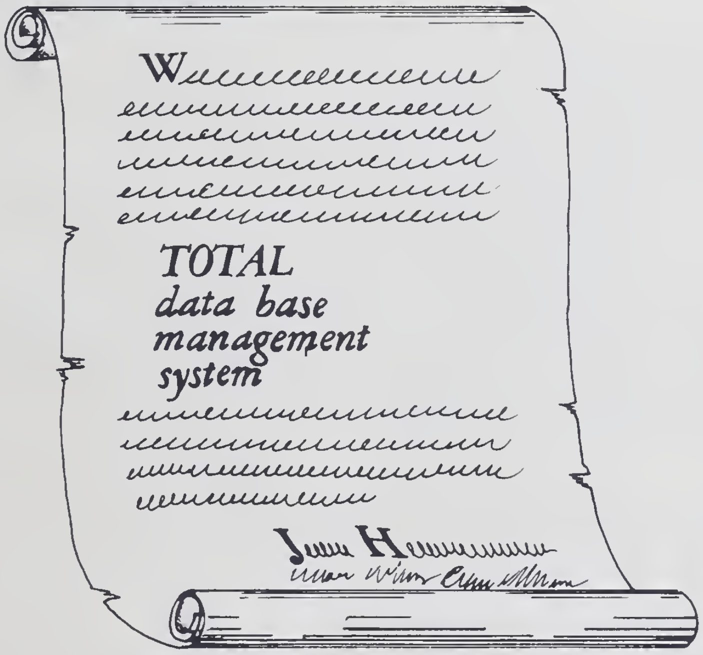
In the meantime, the subject came up again on Capitol Hill last week in hearings on proposed legislation providing for privacy and security of criminal justice information systems.

Here, states' rights proponents urged the enactment of legislation limiting the FBI's activities in state and local law enforcement.

Massachusetts Attorney General Francis X. Bellotti told the Senate Judiciary Committee's Subcommittee on Constitutional Rights that the Justice Department's new privacy and security regulations do little more than "codify existing inadequancies and lack of control over current federal criminal justice systems."

He called the regulations "unequivocable evidence" of the Justice Department's "unwillingness or inability to regulate itself and prevent further encroachment of 10th Amendment rights."

Describing the FBI collection of "rumors, gossip and information about the private lives of people who are not criminals" as "dangerous" and "accelerating," Bellotti said the regulations are "compelling testimony for the urgent need of legislation."



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Based on Hinky Dinky Issue

System Allows One-Stop Shopping, Banking

By Patrick Ward
Of the CW Staff

CLEVELAND – The concept of one-stop shopping and banking is spreading.

First Federal Savings & Loan Association of Lincoln, Neb. shook the banking world early last year by installing IBM 2730 transaction validation terminals at two Hinky Dinky markets.

Although run by supermarket employees, the plastic card-activated terminals were linked to First Federal's IBM 370/135 and allowed both deposits and withdrawals from the customer's savings and loan account.

Commercial bankers went to court to question the legality of the operation, but lost in the Nebraska Supreme Court this spring. There hasn't been another challenge since, a First Federal spokesman said.

Shoppers can now make First Federal deposits and withdrawals from 24 Hinky Dinky markets, and Omaha National Bank customers can use the same supermarket terminals for their transactions, too.

Marketing Subsidiary

First Federal has set up a subsidiary, TMS Corp. of the Americas, to market its Moneyservice package to other banks and savings and loan institutions. Aurora, Ill. and Washington, D.C. banks have signed up as licensees, as has Broadview Savings and Loan of Cleveland.

Broadview customers will be able to use their encoded plastic cards to cash checks and make deposits and withdrawals in 50 Pick-N-Pay supermarkets by the end of September, according to Jerry Laughlin, Broadview's systems manager.

Following the Moneyservice pattern, a Broadview customer presents an encoded card at the supermarket courtesy booth, recites to the clerk a second security code and fills out a form much like a credit-card payment slip.

The clerk inserts the card into an IBM 3604 banking terminal, keys in the amount and receives a transaction authorization. The customer can then either cash a check or make a deposit or withdrawal.

The customer receives a hard-copy record from a credit-card-imprinting device and also receives a monthly Moneyservice statement from his bank.

Benefits to Broadview

Moneyservice benefits Broadview by allowing it to provide extra banking locations and hours for its customers' use, according to Mark Johnson, Broadview's vice-president for systems and programming.

Supermarket banking can be seen as a substitute for extra bank branches, he said. Broadview also considers Moneyservice as an alternative to automated teller machines costing $35,000 to $40,000 each, he said.

However, Broadview has not ruled out acquiring machines of that kind, Johnson stated.

Benefits to Supermarket

The supermarkets benefit from a reduction in bad-check losses, because Moneyservice provides better identification of the person cashing the check and because the Broadview customer's savings account covers the checks he cashes, Johnson noted.

Additionally, "our customers are likely to become their customers, and vice versa," Johnson observed.

And since a customer is likely to deposit at least part of the checks he cashes at the stores, the supermarkets have to carry less cash in their drawers, he said.

Consumers benefit by being able to do their banking along with their shopping, Johnson said.

There is no Moneyservice charge for cashing checks in the supermarkets, and the savings accounts draw continuous interest.

Broadview already has 125 Moneyservice terminals installed in its branches as an alternative to passbook savings accounts.

The combination of the coded card and the spoken security code makes a Moneyservice account safer than a savings passbook, a Broadview spokesman said. An additional advantage is that a husband and wife can both hold Moneyservice cards, while they have to share a single joint savings account passbook.

Broadview is actively pushing the Moneyservice concept with free travelers checks, free gift checks and other enticements.

Broadview currently has three leased lines allowing for 2,400 bit/sec transmission under the Synchronous Data Link Control between the terminals and the bank's DP center.

The shop has an IBM 3705 communications controller and a 244K 370/135 running under DOS/VS and the Network Control Program. One of the 135's three partitions is dedicated to the on-line task.

Broadview Savings and Loan teller displays plastic card used to complete financial transactions at supermarkets as well as bank branches.

Corporate Goals Prime Concern of DP

ATLANTA – "To increase corporate profits, to reduce corporate expenses, to provide for improved corporate control of the company and to help the company better meet competition" are the objectives which must be kept in mind while measuring the costs and benefits of any computer project.

"Corporate requirements have become a prime consideration for all proposed DP projects," Herbert B. Safford told Data Processing Management Association (DPMA) Info/Expo attendees here recently.

Today's DP managers must consider all the new challenges, including budget cutting, expense reduction, declining sales and spiraling inflationary costs, in their evaluations, said Safford, project control coordinator at GTE Data Services, Inc.

In measuring costs and benefits, the first and foremost consideration has to be "what the project must accomplish," and this must be examined in light of such criteria as the type of economy the project must operate in, the market it will address and how it will be affected by supply and demand, Safford said.

Cost controls built into the system, parameters available as guidelines and response ability to changing forecasts must also be pondered, he said.

To justify a project to management, several questions must be answered. Will the project increase profits? Reduce expenses? Improve corporate control of the company? Help the company to better meet competition? Is it required by government?

"If the answer to more than two of these questions is "no" or even a qualified "yes," then the benefits of the project are marginal and the project should be given low priority for implementation," Safford said.

"The most effective tool a DP manager must use in today's economy to justify DP projects is to understand the objectives of corporate management for your company and to correlate your project planning to meet these objectives," he said.

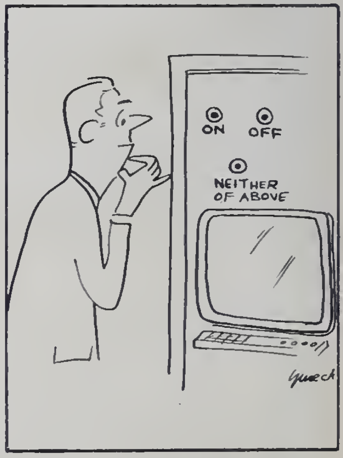
Cost Justification Tools

Safford outlined several tools for project cost justification, including modeling. Even though the results of modeling may prove the project not beneficial, the added cost and time required to build and run the model are well worth it, he said.

"Another highly reliable tool available to DP managers is the involvement of knowledgeable and qualified liaison personnel from customer departments or commercial customers to assist you in project planning and cost/benefit analysis," Safford said.

Safford also suggested the use of more elaborate techniques such as Multiple Element Component Comparison and Analysis (Mecca), a technique developed by Tom Glib, a consultant in Norway.

This technique allows you to formulate objectives by making a several-level hierarchical list of the general concepts which make up "desirability," as defined by the project's objectives, he said.



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UAL Expands Reservation Services

CHICAGO – United Air Lines (UAL) has expanded its real-time reservations system to include hotel and car-rental reservations.

The service, "Apollo One Call," is basically a part of UAL's Apollo airline reservation system which is itself a derivative of the IBM Programmed Airline Reservation System (Pars), according to Glenn Belden of UAL.

In service, the telephone operator, upon making a plane reservation on UAL, creates a passenger name record inside the computer. He then offers these other services associated with travel on UAL.

UAL currently has contracts with Holiday Inn, Howard Johnson, Hyatt, Ramada, Sheraton and Western International hotels, as well as Avis, Budget, Dollar and Hertz rent-a-car companies.

The rent-a-car service has been in effect for some time, but the hotel service was instituted only recently. It adds 2,675 hotels with a total of 460,000 rooms.

In operation, the computer switches to the "service" automatically via aeronautical radio, an industry switching system, to a location designated by the hotel or car-rental company.

Technically, Belden noted, the system can switch directly into the service company's own reservation system or it can switch to a Teletype terminal, for instance, for manual operation.

The system, which operates on a 360/195 located in Denver, is a series of program segments that are called up on demand when a transaction includes the request for hotel or car reservations, Belden said.

'Sharing,' 'Switching' Key Words In EFTS Applications of the Future

By Toni Wiseman
Of the CW Staff

ATLANTA – "Sharing" and "switching" will be the two key words of the future for electronic funds transfer systems (EFTS) – sharing of terminals among service suppliers and switching equipment to facilitate this sharing.

This was the message a panel of users conveyed to attendees at a recent Data Processing Management Association (DPMA) Info/Expo session entitled "Guidelines for Establishing POS/EFT Systems."

Technology is not the reason for the trend toward EFTS, the panel noted, but the vehicle.

The change to EFTS is largely the result of pressures from government, business, consumers and competition, according to James H. Jarrell, vice-president at Trust Co. of Georgia.

A major thrust, he noted, has come in the area of automated clearinghouses (ACH), facilities which perform interbank clearances, paralleling – but automating – the present check collection systems.

ACHs will handle both debits and deposits, Jarrell stated. Insurance premiums, rent, mortgage payments, utility bill payments or any similar recurring expenditure can automatically be debited from an individual's account while payroll payments, dividends and interest are deposited in the same manner.

The government is very interested in these systems, since it makes more than 49.5 million "repeat" payments each month such as military payments, welfare checks, etc., he noted.

ACHs, as opposed to some other types of EFTS, are receiving a great deal of attention because they are immediately feasible, noncontroversial, low cost and have a heavy government commitment, Jarrell said.

"It is inevitable that all banks will be involved in these systems somehow at some time," he said.

Dr. Allen Lipis, project director for the Payment Systems Research Program, noted that the objectives of transferring funds at the point of sale (POS), be it through ACH or other EFT systems, are lower processing costs, expanded services, reduced losses from bad checks and reduced credit abuse.

"Where we once had credit-card authorization, we will have credit-card data capture, posting a transaction directly to the consumer's account, thereby avoiding paper handling," he said.

The question of sharing was covered by James J. O'Halloran, director of EFTS for American Express Co., who said the principle motivation will be cost saving, since communications costs are the single largest budget item in EFTS, amounting to some $35 per terminal each month.

It's only a matter of time, O'Halloran predicted, until a store or restaurant has one terminal for all services, including banking and major credit cards. The cost and inconvenience of three or four terminals at the POS will not be tolerated.

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Systems Seen As 'Corporate Mirrors'

By Edward J. Bride
Of the CW Staff

ATLANTA – Computer systems are "probably the best corporate mirrors made," in that they reflect "our ability to think," according to Charles P. Lecht, president of Advanced Computer Techniques Corp.

At the Data Processing Management Association (DPMA) conference here recently, Lecht said people often blame the mirror – the computer – if they don't like the image they see.

A company's style of management and the "organic harmony" of the people will be reflected in its systems, and changing those systems will not change the company, he said.

In other words, if changes appear to be in order, they must be applied to the reflected entity – the individual or the company – rather than to the instrument of reflection.

Lecht likened the current enthusiasm over the minicomputer – a machine dedicated to one task – to "fragmenting" a mirror to get a better, clearer picture of a small portion of a company.

He saw minicomputers not as the embodiment of high technology whose arrival is finally satisfying a need, but rather as a marketing phenomenon. The pendulum may well swing back toward large machines some day, he indicated, if people try to run large applications on machines that are too small.

Lecht also claimed the long-term effects of computers on corporations are not really known, and that the current activity in the minicomputer field is a reflection over the debate on centralized vs. decentralized management.

Many corporations today are going through catharses, he continued, adding that the "epicenter of power" is being affected by the computer, and that many individuals "don't know where they are" in relation to that center of power.

With this uncertainty, and reorganizations of DP divisions because "it makes people nervous to be around us" when they don't know how to use computers, the long-term impact of computers may be different from short-term financial benefits, he said.

Since "computers reflect our ability to think," he said, a company which cannot use a computer well probably shouldn't be using one at all.

Additionally, if a person or company is having difficulty controlling one large system, it is a mistake to believe fragmenting the system into many smaller computers will in and of itself make the management job easier, he said.

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Editorial

Women in DP: Two Views

Many women in DP might agree with the programmer who told *Computerworld* that a woman who wants to get ahead in the industry must "own her own firm, sleep with the boss or just be 10 times as competent as any male" ["Majority of Women DPers Find No Job Discrimination," CW, July 23].

This survey found a majority of women are satisfied with their jobs and prospects. Others, however, are angry and disillusioned – but still are willing to fight the system, even if that means proving themselves over and over again to be just as good or better than their male counterparts.

The 30 women surveyed were taken from a list of Computer Caravan attendees and could be considered somewhat select themselves. According to a Caravan official, less than 10% of the attendees were women and, he added, attendees are usually the employees considered most valuable by their employers.

While some firms are trying to give equal opportunities to women, many firms, especially the larger ones, are doing only what is necessary by law. And tokenism is never a substitute for fair and equal treatment.

Also, subtle attitudinal biases can be just as dangerous as inequality in hiring, salary or promotions. Attitudes of coworkers, whether they be patronizing or resentful, can help to "keep a woman in her place," damage her self-confidence or make her feel "it's just not worth it."

Many of the women interviewed felt the greatest contribution of the feminist movement so far has been to change some of these attitudes or at least make people aware of them.

Most of the women believe it is easier now to get a job in the field than ever before. But for those women who want to get ahead, who want to change things within their company or promote their own ideas, it is often just as difficult and they encounter just as little affirmative response as before.

Since a good share of these female employees told CW they feel discrimination to some degree, the computer industry shouldn't pat itself on the back until it evaluates current practices, attitudes and policies and, if necessary, changes them.

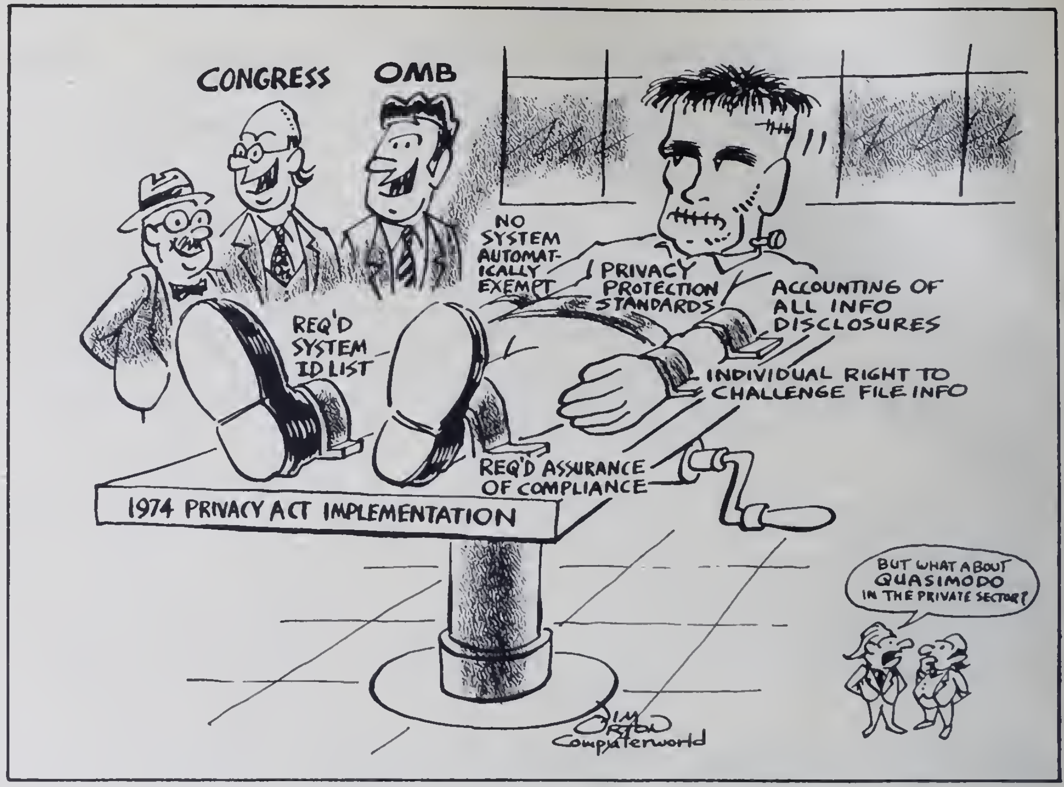
— — —

It is encouraging that most of the DP women responding to a recent CW survey found no discrimination on the basis of sex within the industry.

It is interesting that most of those surveyed said small companies provided greater opportunity than larger ones for recognition of their talents. Perhaps this indicates larger organizations do not provide women with the chance to demonstrate their abilities.

In any case, the survey showed 60% of the women feel they have encountered no discrimination. This is probably a larger percentage than most other industries and the discrimination found by the other 40% may be due to policies established by individual companies rather than by the industry in general.

But no employee in any industry should be able to demand a position based on a circumstance of sex or on any other noncontrolled factor. There is plenty of room within the DP community for talented individuals. But there is no room in any industry for those who assume positions they cannot adequately fill.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'He Shouldn't Bother You Much Anymore . . .'

Letters to the Editor

Programmers' Experiences Good With Use of Cobol Report Writer

Referring to the article "Does Cobol's Report Writer Really Miss the Mark?" [CW, June 18], we would like to say the following.

In our firm, the Cobol Report Writer feature has been used for some years. Did IBM bring the subject to our notice? No, it didn't. Management of our DP department encourages us to read the manuals in our spare hours, as a result of which all the programmers are familiar with Cobol Report Writer, Internal Cobol Sort, etc.

Our experiences are as follows:

- The logic of the report is embodied very clearly in a separate section of the data division.
- The procedure division is very short.
- The programs are very reliable and little testing is demanded.
- The Report Writer is very easy to maintain.

On account of the use of the Report Writer, which did not cost any extra money, the purchase of a report generating packet has become superfluous.

Oene Nieuwenhuis
Freek Zijlstra
Zaandam, Netherlands

Systematic Approaches Available

"The Taylor Report," [CW, July 2] explained problems which are caused by the ambiguous symbol "0," in this case used in the word "ounce."

Alan Taylor asked, "shouldn't we aim to come up with systematic approaches to eliminating the errors?"

There is a system already available to overcome the problem – it's called metric.

Neil Allison
Toronto, Ontario

Metric System Helps Prevent Gigo

Part of the problem Alan Taylor discussed in the recent column on Gigo is due to outdated measurement units.

In a metric system, this problem does not exist. One would have 2.5 kg or 2.25 lbs.

Sometimes we are faced with problems which may well be solved by "changing the terrain to fit the map."

Andre Jensen
Oslo, Norway

Find Cause of 'Hot Spots' First

After examining the supermarket label in "The Taylor Report" [CW, June 18], I would say the character "O" in 3OZ looks the same as the "O" in Calgonite and pound, and it does not look the same as the zero in 106 and 2130.

Alan Taylor indicated the output of pounds and ounces should have been checked. Maybe so. But what good would it have done in this case. The output is 3 ozs, and that is good data. It is true that 2 lbs 30 ozs at 28.1 cents per pound equals $1.09, but that doesn't explain the pricing error on the label.

An answer to the cause of the problem would have been of value to some of us. Perhaps the cause was that the price was entered on the label after the weight was entered, and there may have been another keying operation in which the operator entered 2 lbs 3 ozs as 2 lbs 30 ozs.

To clear up "hot spots," it is necessary to know when they took place. Of course, I agree with Taylor the designers have a responsibility to program against obvious errors.

Charles B. Davis
Okmulgee, Okla.

TV Could Educate Public About DP

I was pleased to read the editorial, "Participation Needed," in the July 2 issue. As suggested, professionals involved in the computing industry need to participate more in the area of public education concerning computer systems.

I have often wondered why there has never been a TV special on computers. A documentary or a special report would not only be interesting and informative, but it could shatter various misunderstandings and make the general public aware of the real villain.

If the masses are ever to understand computers, their capabilities and their limitations, television has to be involved. So I suggest this as another means, and a very powerful one at that, whereby computing professionals can get involved in public education.

Dr. Ronnie G. Ward
Arlington, Texas

Price of 370/145 'Puzzling'

An article in the July 9 issue of *Computerworld* entitled "DPer Must Be Businessman First" is a great puzzle.

It is difficult, if not impossible, to understand how Martin Pater could get an IBM 370/145 "for about the same amount" as a 360/40.

Even if the 360/40 was straight IBM rental as opposed to the leased 370/145, the two machines are so vastly different in price that paying "the same amount" is inconceivable.

Pater badly mistated his savings, since it is known 360/50s and 65s can be acquired for less than a 370/145 no matter what the financing and can generally handle the same workload.

David F. Gortner
El Toro, Calif.

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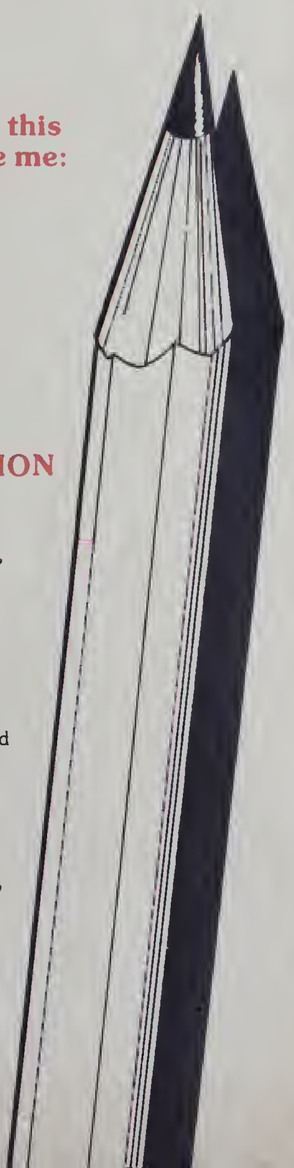

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Greedy Games

Events like the failure of IBM to submit a Federal Supply Schedule for fiscal year 1976 – that is, to agree to rental, lease and sales contract terms with the General Services Administration (GSA) and the agencies and departments it assists – point up once more the enormous behind-the-scenes pressure on standards, performance evaluation and procurement regulations. The Feds put between $1 billion and $2 billion a year into the hardware and software marketplace, and then of course spend at least twice as much on operation: salaries, installation costs, general overhead and the like. The struggle for pieces of that vast bonanza is harsh, ugly at times, but probably healthy in the long run for the industry and for non-federal users alike.

There is also a continuing effort to increase the total pot, and a key factor in that effort is Cbema, the Computer and Business Equipment Manufacturers Association. In a column about Cbema sabotage of the Cobol standards validation process [CW, Dec. 11] I denounced the idea of such an outfit sponsoring the American data processing standards committees. The suppliers organize to force inefficiency on the users, and then turn around and compete for the resulting wasteful business by claiming their individual offerings will alleviate some of the pain they collectively caused! Wow!

It's not just standards and procurement methods, of course: the Virtual ripoff was a technological parallel. But the Cbema attack on government application of computer standards is so unethical, and so open and coarse and ugly, I have to yell particularly loudly.

A draft paper submitted to the Standards Planning and Priorities Committee of Cbema by Very Black Hat Vico Henriques talks openly about conflict between standards development and benefits from "use in their present state of development" – that's jargon for "back to the drawing boards, fellas!" And even more nastily, the paper recommended flatly that standards development "should not be linked directly to the government's procurement program."

Ruth Davis, my successor at the Bureau of Standards, meets with these people. I would never have done so, even though Charlie Phillips was a White Hat, and Bema (as it was then) never had the gall to ask. I have no way of knowing what her personal or official reaction to Cbema attacks on the very core of her institute are. I hope she resents it and is calling on GSA, the Department of Defense (also active in standards) and if necessary the Attorney General to repel these greedy attacks on government probity and efficiency.

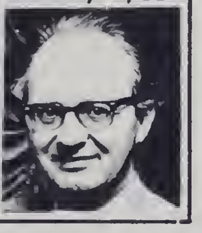
Herb Grosch

Vendor Has Duty to Inform, Warn

All User Rights Not Given Up in Signing Contract

The computer contract signed by most installations includes many restrictions on the right of the user to get what he expects from the system.

The Taylor Report
By
Alan Taylor, CDP



They often, for instance, include clauses saying that nothing in the proposal provided by the computer vendor is included in the contract. Other clauses restrict the time in which any legal action can be brought or the amount of money a user can recover in the event of a dispute.

These contracts are very one-sided documents produced by the vendor for his own purposes and appear to leave the user practically at the mercy of the vendor.

However, things are not always quite what they seem. After hearing complaints about the computer contracts from *Taylor Report* readers, I have been talking with some lawyers about them and have come up with some fascinating items every trained DPer should know. These are items which strengthen the user's negotiating position and return some rights to him he may think he has signed away forever.

The basic point is not that anything in these contracts is wrong. The contracts interpreted legally can be just as restrictive as they appear to be on the surface. However, they themselves may not be legal contracts at all. Despite these contracts, the law recognizes the user's right to be accurately informed, properly warned of dangers, etc., even though these are rights which don't exist under the printed-form contract.

Now, there is something worth thinking about.

Vendors Relied On

Some user rights spring from the technical and changing nature of computers and computerized systems.

Almost every system marketed today contains some new and potentially revolutionary feature. New applications are being designed and sold by the dozen to people who normally are not knowledgeable in either the new application area or in the particular solutions and techniques to be used. These users, in brief, have no option but to rely upon the vendor for information.

This need to rely on a vendor is legally recognized in two ways. In any event, says the law, the parties to a contract are expected to have what is called "a meeting of the minds." The information the user gets must, therefore, be sufficient and accurate, otherwise there is no such meeting.

If there is no such meeting, then there is no real contract, even though what appears to be a contract has been signed between the user and the vendor.

The law also recognizes some situations are more dangerous than others. Where something that is really dangerous is being contemplated, the law demands the vendor keep the buyer informed about the dangers implicit in the situation.

This means suppliers are no more free to sell dangerous computer products than makers of dynamite are free to sell to children. Computer sales of dangerous products can be voided if proper warnings are not given to users.

This no-warning situation provides a user who suddenly finds that some report upon which he or his customers have been relying is inaccurate with a reasonable complaint against the vendor who sold him the computerized system producing the report – unless the vendor had warned him the information from the computer was liable to be inaccurate before taking his order.

The fact the contract does not guarantee the accuracy of the report is no vendor defense as the failure to warn deals with what happened before the contract was signed.

The extent of the legally necessary warnings depends upon the degree of danger that exists. If a hidden danger causes, say $100 damage maximum, some warning is needed, but not as much as if the damage could be expected to be, say, $1 million.

Equally, if the damage is quickly repairable so that it won't reoccur, the vendor's duty to warn is much less serious than if the damage is impossible or difficult to repair once it has occurred. The level of duty depends on the facts of each particular case.

New Users Vulnerable

Computer users, particularly first-time computer users or users who have gone into new applications, have in the past found themselves vulnerable to having unusually heavy and irreparable damages occurring when some unexpected danger causes difficulty.

It may be found that to eradicate the danger the whole system has to be changed, which could take months or even years.

Equally, the firm's reputation may have been hurt at a particularly vulnerable time, so that even though the system's problem is corrected, the situation causes a permanent loss of reputation, etc., etc. So this duty to warn may be particularly valuable to this class of computer user.

Mind Meetings

The "meeting of the minds" concept is just as powerful an assistance to users in their dealings with vendors as is the lack-of-warning argument. The concept is that, for a contract to be valid, both parties must be thinking the same way.

There are three major reasons the vendor and the user may not be thinking the same way:

- Wrong data – the information given by the vendor to the user is wrong, and the vendor knows it or should realize it.
- Lack of intent – the vendor tells the user he will do something that is not in the contract, when he actually has no intention of doing it.
- Hidden data – the user has been unable to inspect the product, and the vendor does not tell him of the disadvantages of the product the vendor knows about, but the user doesn't.

Real Vendor Duty

Again, the technical facts of computer hardware and software can increase the vendor duties to see that the contract he is offering is a legal one. Prospects and even users of computers are not in as good a position as the vendor to inspect the product.

Users don't generally see mean-time-between-failure analyses, although vendors normally have them and have people who understand their implications. Users don't see the software error reports and often don't see the software controls.

The current concealment of all these quite normal technical items make it difficult for the more-knowledgeable vendor to comply with the laws requiring a real "meeting of the minds."

And it is really the vendor's (not the buyer's) problem to create such a meeting if he wants those restrictive clauses in his preprinted contracts to be enforced by the courts.

Misrepresentation

One final problem area can and does arise. This is when the product is "innocently" misrepresented.

Here there can apparently be a meeting of the minds. Both vendor and buyer can think the product will have a throughput of 10,000 orders an hour or will have maintenance needs only once every three months or will provide an accuracy of 1 in 10,000 or what have you.

But if the product just doesn't have these capabilities, the fact the vendor thought it did doesn't make the contract valid. No real meeting of the minds is said to have occurred, because the vendor was thinking of his product, while the buyer was thinking of a product with the represented capabilities.

So, as you can see, there are many requirements a computer vendor has to comply with before he can claim the contract exempting him from so many responsibilities is a legal one.

And, if it isn't legal, then there are different rules as to what a wronged computer buyer can get by way of recompense.

The rules regarding this will be reviewed later in this series. Next week we will review the user and vendor duties at various times during computer procurement, implementation and use.

This is the first of a series of columns dealing with user contracts and the prevention of computer fiascoes which will be published over the next few months.

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Some Programming Deserves 'High Technology' Label

By Martin A. Goetz
Special to Computerworld

Over the years there has been a great deal of controversy as to what programming and software really are and whether programming will become obsolete when software is put into hardware or firmware.

The questions have also been raised when discussing the patentability of software. Is software (or programming) mathematics? Does one patent the program or the process? Is software merely the duplication of a manual procedure and, therefore, always obvious in its implementation?

And there are those who believe that, when computers can accept the English language syntax directly, there will be no need for software or programs.

These questions and positions have been with us a long time. Back in the late 1960s, international meetings on software engineering were held to define what programming was, what the problems were in developing and constructing large software systems and how software could be engineered.

The questions are being asked again – by the Institute of Electrical and Electronic Engineers (IEEE), the Association for Computing Machinery (ACM) and the National Bureau of Standards (NBS), which are currently sponsoring meetings on software reliability, and in discussions on structured and modular programming, top-down development and testing, the chief programmer concept and testing methodology for programs and systems.

To these, we will now add another important question: "Is programming high technology?"

To answer the question, we must agree on a definition of "high technology."

Technology is derived from the Greek and means a systematic treatment of art. English usage defines it as a technical language, an applied science and a technical method of achieving a practical purpose.

Reader Commentary

"High technology" is not defined, but is commonly used to imply significantly new, innovative and often difficult achievements in technology.

Generally, high technology has not been used to describe computer programming.

Complexity of Process

Unfortunately, over the past years all programming has been lumped together into a catch-all phrase – computer software. But all programming is not the same, neither in terms of its development nor its ultimate use, so it cannot be considered as one single kind of thing.

There is, for example, a significant difference between automating a simple business application and designing a complex operating system.

There is an even greater difference between programming which automates manual applications, be they business or scientific, and programming which controls a complex process through a computerized system. Whether the programming controls a complex process is, perhaps, the key distinction when deciding whether programming is high technology.

Let's consider those areas of programming which might be termed high technology. Most system software programs have several things in common: each controls a complex process, each is general, each is costly to build and each requires experienced and knowledgeable computer specialists (chief programmer types) for its proper design and implementation.

An operating system, for example, controls computer resources, programs and data and controls their interaction and effective use within a computer. Probably most professionals would agree that such operating systems, when properly built, are high technology.

Similarly, data base management systems, sorts and compilers are software which is very complex and must be designed and implemented by specialists.

IBM uses the phrase "system control programming" to include operating systems. Although I prefer the phrase "control processing," perhaps "control programming" can be used as a criteria for deciding which kinds of programming are candidates for high technology.

In general, all system programs which are general in nature have these characteristics in common: each contains a specific process (or method) for controlling input, output and processing; each generally has a hierarchical structure; and each generally represents the best (and, therefore, probably the most innovative) of many alternate methods for processing, so that each process has been chosen as the preferred method for a particular application and/or environment. And the method is generally a complex machine method which does more than merely duplicate a manual method.

Let's consider applications programs – an on-line airline reservation system, for example. Is that programming system high technology? In my opinion, it is; such systems have all the elements mentioned above (including innovative techniques) and, in addition, duplicate the function of system program components.

For instance, a communication monitor is part of a reservation system, and many components of existing operating systems have been embedded into reservation systems.

What other applications programs might be candidates for the category of high technology? I believe any applications program or programming system with the following characteristics should be included:

- Its procedure does not merely duplicate a manual one.
- Its development demands highly experienced personnel.
- It has a hierarchical machine structure for controlling input, output and complex processing.

In conclusion, I believe that programming is essentially a technology and that there is certain programming – clearly defined by its complexity and innovative nature – which can readily be categorized as high technology.

Goetz is senior vice-president of Applied Data Research, Inc.

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Keydata System Eases Panasonic Post-Sales Support

By Don Leavitt
Of the CW Staff

SECAUCUS, N.J. – Sometimes it costs too much – in time and money – to program and update in-house DP equipment to handle a new application, even if the application is critical.

What can a user do in that situation?

Three years ago, Panasonic's Consumer Parts Division went to on-line processing of its warranty and post-sales support operations (through Keydata Corp.) when it seemed impractical to upgrade the IBM 360/Singer System Ten facilities the company already had in-house.

"We had a lot of equipment here," admitted the division's general manager, George Camp Jr., "but we would have had to triple our disk storage and expand other resources to set up the system we wanted."

Panasonic uses the IBM/Singer gear for sales control, he explained. That type of work with finished items is essentially batch-oriented with relatively few different items and relatively short invoices but high dollar values.

By contrast, the post-sales operation works with 80,000 district parts in five depots across the country "and that means a tremendous effort to maintain the control we must have." The division handles 20,000 to 25,000 invoices, credits and debits a month. "We're a huge paper mill," the manager added.

Camp's operation, scattered as it is, is geared to providing good customer service. Economically and psychologically, he wants to be able to repair and not just replace a customer's unit if there is a problem.

Even dollar volume of the items managed by Camp's system isn't its prime justification – "On that basis, Sales could afford it better than we can." For Camp, the responsiveness available through the on-line hookup is a "necessity."

Control of the parts inventory is handled through 12 hard-copy terminals – six here, two each in Chicago and Los Angeles and single units in Atlanta and Dallas – linked by dedicated phone lines to Panasonic's master file on a Univac 494 at Keydata's computer complex.

Most of the units are used for order entry, invoicing and updating of the individual depot's inventory records. The system triggers an inquiry against the records of the central depot here when a region's own stock is too low to fill an order.

When stock is found at the central depot, the system generates a request for it. This request is treated as a regular order by the central depot so that appropriate paper work is generated and inventory adjusted. The order is shipped directly to the customer, Camp said.

Camp uses one of the terminals for management-level information.

Keydata puts its own label on terminals it supplies users including, for example, this General Electric Terminet at Panasonic.

Camp and his staff considered several alternatives before they went with Keydata in 1972. He was – and still is – impressed with the library of programs available at Keydata that enabled the system to be operational 90 days after the initial contract was signed.

Panasonic would have needed 12 to 18 months to program the work, he estimated, and would still be burdened with modification work as well. Now, as changes in the programs seem needed, Keydata prepares a cost estimate and, if Camp gives the go-ahead, does the programming.

"Even though our volume is 40% to 50% greater today than it was when we installed the system, customer service has improved, and we're nearing our goal of providing two-day turnaround time on 90% of our parts orders."

Library Choice Widens for IBM Users

IBM users have two more program and Job Control Language (JCL) library management packages to evaluate.

Pulmac III from Management and Computer Services, Inc. (Macs) of Valley Forge, Pa., is the updated product. It maintains card image libraries on disk.

A package called Library from GMA Software of Chicago is also designed to store and maintain card image data sets, but in a magnetic tape media. It is said to provide data security and physical protection as well as reduced card handling and storage requirements.

Library was designed for the smaller user who doesn't have disk space that can be devoted to program storage. It does include, however, support for test versions of programs that can be compiled without being added to the primary library file.

The package also provides, as an extra-cost option, an encrypting/decrypting routine that prevents use of any of the stored data unless it is passed through the routine first.

Library requires 40K of memory, but this can be altered by the vendor through reblocking before the package is installed. The basic package costs $995; the security routine is an additional $200, GMA said from 2946 N. Merrimac Ave., Chicago 60634.

Dynamic Chaining

Pulmacs III, based on disk, "competes head-on with the popular library systems available today," according to Macs, and is said to use a dynamic chaining technique allowing "maximum speed and efficiency" when updating the library.

The Macs product includes backup provisions, selective "lock-up" of working programs and protection against inadvertant deletions.

In its DOS or DOS/VS version, Pulmacs III costs $2,500; the OS and OS/VS release costs $3,100. Both versions include one year's maintenance and updates, Macs added from 790 Valley Forge Plaza, Valley Forge, Pa., 19482.

'Shrink' Cuts Files 50%, Adds Slight Overhead

NEW YORK – IBM 360 or 370 users working with Shrink, a compression package from Programming Methods (PM), may reduce disk file space 50% to 70% at a cost of one CPU second per 100K bytes of compressed data, according to estimates from the vendor.

Shrink is a Callable routine that can be invoked from any application program to compress a record before it is written and to reconstitute it after it is read.

The package includes a utility to ease the conversion of existing files to compressed form, PM said.

In compressing typical output files such as assembly listings, Shrink has produced a 70% reduction, PM claimed. The savings will vary, however, since the system tailors the compression/expansion code it uses to the characteristics of the file being processed.

Shrink can compress any type of data and requires no predefinition of the data to function. The more information that is provided, however, the higher the compression ratio will be, PM said, noting that users impart information about the files through a specialized language.

Shrink's compression improves according to the frequency with which a character occurs. Bit codes are generated for the characters by way of a one-time preprocessing pass; the more frequently the character occurs, the shorter its encoded representation, PM said.

The techniques utilized by the package mean the same information carried in two different files – a Social Security number, for example – might well be compressed in different ways, depending on the frequency of the digits within the individual file.

Shrink modules require 8K of memory plus a variable amount per file. A batch-oriented version is ready now; an on-line version is "a few months" off.

In either form, Shrink costs $10,000 for the first CPU, $2,500 for each additional mainframe.

PM, a division of GTE Information Systems, is at 1301 Avenue of the Americas, 10019.

Award Candidates Sought

FALLS CHURCH, Va. – The nominating committee for the A.A. Michelson award is seeking the names of candidates from the computing community at large.

The award – "for significant individual contributions to the advancement of computer systems measurement" – is to be presented at the annual meeting of the Computer Measurement Group (CMG) in October [CW, July 9].

CMG sponsors the award (honoring Albert A. Michelson, a physicist who measured the standard meter in terms of the wave length of cadium light) to encourage interest in the search for a good basic unit of measurement in computer activities and to recognize progress as it is made.

Names and addresses of nominees with descriptions of work that could qualify for the award should be sent to the nominating committee chairman, M.F. Morris, c/o Boeing Computer Services, 7777 Leesburgh Pike, here in Falls Church, 22043, before August 15.

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Poor Program Modules Add Extra Layer of Obscurity

By Edward G. Nilges
Special to Computerworld

Concepts and Techniques

Good modular (and structured) programming works. Bad modular programming only chops up working code, adding an extra layer of obscurity which degrades rather than improves the maintainability of the code.

Above all, the syllogism "My programs are modular; modular programs are clear programs; therefore, my programs are clear programs" must be avoided; the most modular program is unclear if its maintenance programmers cannot understand it.

The most vivid description – but the poorest definition – of a program "module" is "a group of statements, with a single entry and exit, listed on no more than one printer page, that accomplishes a single function."

This description draws attention to the wrong things. The two most vulnerable phrases are "with a single entry and exit" and "listed on no more than one printer page."

A complete application program which is a confusing mess has, ultimately, one entry and one exit. A paragraph group with mysterious data names and maze-like control structure which has a single entry and exit and is listed on one page is still a confusing mess – if it cannot be understood.

Sometimes, rarely, efficiency warrants multiple entries to avoid scanning control parameters, and overemphasis on the printer page rule can result in very "tight" coding the only reason for which is to keep the code on one page.

The most mysterious phrase is "having a single function." The mainline module of a multifunction program may, in a sense, have more than one function. More seriously, "function" is vague outside of mathematics.

A mathematical function is an operator which when applied to an object specifies one and only one other object. For example, the square operator specifies 4 when applied to 2. The concept is still clear if the "objects" of a function are pairs or sets of numbers; the function of addition specifies 5 when applied to the pair (2, 3).

However, most mathematical functions have only to do with numbers or sets of numbers. The entities of a Cobol program are not always numbers; they may be character strings, flags, codes and so forth.

English Analogue

The best analogue of functions for the Cobol programmer is the simple English imperative sentence of the form; verb, subject, connector, object. The subject and object are nouns, noun phrases or groups of nouns and noun phrases. The connector is a word such as "to" or "from."

The syntax of the Procedure Division in Cobol is built around this form; in English we say such things as "Move that brick over there" and "Send the informational brochure on the Smedley-90 calculator to my home address" when we wish to be understood.

The conditional imperative is only slightly more complicated, being of the form; If, sentence, simple imperative sentence (the first "sentence" is a hopefully simple true or false declarative). An example is "If you have not already done so, send the informational brochure on the Smedley-90 calculator to my home address."

The simple imperative has one state of affairs as its "input" and another as its "output." It is easy to obey (or disobey) since what is wanted is known; likewise, it is easy to determine whether it has been performed.

Program modules are clearest when their "function" can be explained using a simple imperative (conditional or unconditional). For example, consider a program which is to print totals, zero them and print a page heading on a change in account number.

If it is written in a poorly modular style, it might contain an "account break" module. But does "process 'account break' " explain anything? It is only a tag that arbitrarily labels the module, since to learn how the account break is processed we must go to the module code. The code can be anything the programmer likes; "process 'account break' " conceals rather than reveals, the meaning.

If the specification is unpacked into three English sentences, it is obvious three modules are needed:

- Write totals on printer.
- Move zeros to totals.
- Write page heading on printer.

The program will be clearer and more maintainable, since the programmer is no longer free to "process" data the way he or she likes. Note how easy it has become to alter the program to print totals and page headings without zeroing the totals (this will be necessary if a form overflow condition occurs). simply call the first and last modules when form overflow is detected. In the single-module version, extra code would have to be included in the module to determine whether the totals should be cleared.

A good standard for using this method is to explain what the module does in one simple sentence that contains a clear imperative (such as "This module moves zeros to the account totals") in a comment at the top of the module listing. If a reader familiar only with the Data Division, the calling code and this sentence can understand what the module does well enough to write an equivalent version, then the module is well defined.

Module specifications of this sort look like Cobol statements. The difference is the programmer defines the verb of the specification to the Cobol compiler by writing the code (he does not define it to the program reader in the code; the verb's meaning should be self-evident). Cobol verbs are predefined.

Avoiding Confusing Implementation

However, the implementation of a well-defined function or imperative sentence can still be a confusing mess. There are countless Fortran programs which implement straightforward equations in a puzzling fashion.

This is because modularization does not go far enough, because of the confusion of program modules and functions. All good modules implement functions; but

(Continued on Page 13)

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'Modfile' Builds Skeletons

RICHMOND, Va. – Cobol programmers working in almost any machine environment can create skeletons of programs to handle sequential files by invoking appropriate library routines from the Modfile package marketed by Diversified Engineering, Inc. (DE).

Developed initially in Bombay, India, Modfile is a modular file-matching package which provides for sequence checking of as many as six files with low sequence detection.

In essence, the routines standardize mainline logic and generate source code for both sequential and indexed sequential processing, DE said.

It includes control break detection of one to 10 control levels with branching to the appropriate user-defined routine as the control breaks are sensed.

While the package generates much of the coding needed and the same general structured design for each program skeleton it does create, it leaves a number of tasks to the programmer. Data division entries for the control fields and for control break indicators must be specified by the user.

Modfile is invoked through the user's choice of four Copy statements. The package also provides exits to standard paragraph names.

Described as economical on core, Modfile requires, in addition to buffer space for the files themselves, 150 bytes to handle two files or 400 bytes to handle three files, including control breaks.

Supplied in source code, the package is machine-independent and has been installed on IBM, NCR, Honeywell, Univac, ICL and Burroughs CPUs.

It is available for approximately $1,000 from DE at 2022 Sledd St., 23220.

Broader Range of DBMS Support Offered Small User With DRS II

PRINCETON, N.J. – Version II of DRS, a data base management system (DBMS) for small computers, is now available from A.R.A.P.

This version of DRS includes support for 16 different record types, hierarchical data structures, inverted indexes and large data bases.

Also included are several new commands, a data base analyzer, a programmer interface, expanded peripheral device support, improvements to the MODIFY and DELETE commands and a data base dump/restore utility.

DRS is a user-oriented data base management, retrieval and reporting system which may be operated in batch mode, interactively through the console, or on a remote terminal in a dedicated or time-sharing environment.

It can be used with data bases containing variable or fixed-length records and ranging in size on small computers up to 85M bytes.

A DRS data base record may contain any mixture of numeric, textual or calendar data. DRS has calculation facilities for handling scientific or financial data and word/phrase extraction facilities for textual data, the spokesman added.

The small computer version of DRS is available for the Computer Hardware 2130, the Digital Scientific Corp. Meta-4, General Automation 18/30 and the IBM 1130. Versions for other small computers are available on a contract basis.

Minimum core required is 8K 16-bit words for small data bases, 16K 16-bit words for nonhierarchical systems and 32K 16-bit words for hierarchical systems.

The purchase price starts at $2,300. Lease and rental plans are available.

DRS is also available on the IBM 360 and 370 computers as well as on a nationwide time-sharing network. Data bases created on small computers are upward-compatible with DRS/370 and may be readily transferred to the 360 or 370.

A.R.A.P. can be reached through P.O. Box 2229, 08540.

Poor Modules Befog Programmer's Logic

(Continued from Page 12)

not all functions can be clearly implemented by one module.

Perhaps it should be said a "module" is a group of statements which do not call any other modules. A "good" module is one that can be explained in a single conditional or unconditional imperative sentence, that neither parrots the code nor is a meaningless label. A program "function" is a group of statements, modules or smaller functions; a good function can be clearly explained in a simple imperative sentence.

Nilges holds a certificate as a Registered Business Programmer (RBP) awarded by the Data Processing Management Association.

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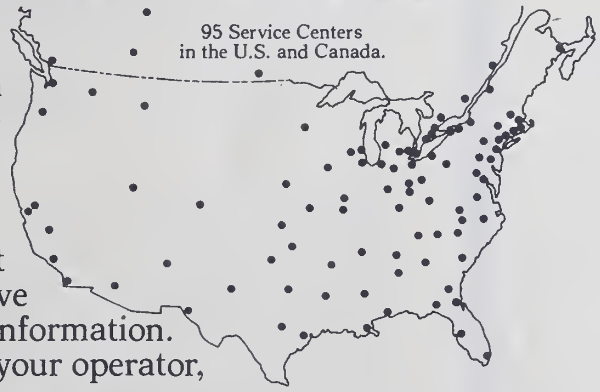

Think what the Model 350 can do in your sales order entry applications. It lets you store customer, product/price and salesman files right at the source. Or use it to retrieve data, maintain and update files—even to generate reports.

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The world of EDP is caught up in a continuous revolution. It's only 24 years since the first business computer made its appearance, and we've gone from tubes, batch processing and single-site giants to multiprogramming, time sharing, data communications, giant minicomputers and hundreds of other technological innovations that were unheard of only recently. Keeping up with this revolution is difficult, to say the least. And that's why we've created the EDP Seminar Series.

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We've selected leading experts from around the country to guide each of our Seminars. They are highly accomplished specialists in their fields, experienced in presenting their techniques to industry and management. If you're involved in one of the areas shown, you should attend the EDP Seminar Series this fall. What you learn will benefit your company, your installation, and you.

Data Communications Course #1010 — Practical Data Communications Systems & Concepts

Dr. Dixon Doll, the nationally recognized teleprocessing consultant will lead this two-day seminar on the newest advances in data communications. The course covers areas like SDLC, HiD-LoD, DDS, newly approved major revisions to WATS, and the impact of Satellite Carriers.

Total Cost, including workbook, reference materials luncheons and continental breakfasts is $350. Additional registrants from the same company qualify for the reduced rate of $300.

San Diego	**Plaza Int'l Hotel**	**Sept. 29-30**
New York	**St. Moritz**	**Oct. 13-14**
San Francisco	**Dunfey's Royal Coach**	**Oct. 20-21**
Miami	**Hyatt Miami Beach**	**Nov. 17-18**

Data Communications Course #1020 — Advanced Teleprocessing Systems & Design

Also led by Dr. Dixon Doll, this course is a follow-up to course #1010. Special emphasis is given to techniques that minimize operating costs in commercial data communications networks. This three-day seminar covers procedures, approaches, and algorithms for evaluating and cost-optimizing network operations.

Total cost, including an extensive set of customized course materials, is $450. Additional registrants from the same company qualify for a reduced rate of $400.

Miami	**Four Ambassadors (Sheraton)**	**Dec. 1-3**

Legal Tools for Computer Contracting and Protection

Under the instruction of Roy N. Freed, a nationally known lawyer, author and educator in the field of computer law, you'll learn how to increase your advantage in dealing with vendors that supply your installation. As well as practical discussion and review of your own contracts, subject areas covered in this 2½-day seminar include: Negotiations, Contracts, Warranties, Avoidance and resolution of disputes, Security, Fraud, Taxation, and Techniques for handling any transaction. Cost for the entire seminar, including continental breakfasts, luncheons and all course materials is $325. Additional registrants from the same company are charged only $275.

New York	**Summit Hotel**	**Oct. 22-24**
San Francisco	**Hyatt Regency San Francisco**	**Nov. 12-14**
Chicago	**Hyatt Regency O'Hare**	**Nov. 19-21**

How to Draft Effective Legal Agreements

This one-day seminar is a complete workshop for non-legal, technical people who may be called upon to draft legal agreements for their company. Also led by Roy Freed, this seminar covers a variety of formal agreements, their structure and the legal factors involved. You'll have all the basic skills necessary to write legal agreements, and you'll be able to spot items that really require the attention of lawyers.

Cost for the seminar, including luncheon and a complete workbook on the subject, is $135.

New York	**St. Moritz**	**Oct. 8**
Boston	**Sheraton**	**Oct. 15**

Data Base Design

Given in association with Leo J. Cohen and Performance Development Corporation, this three-day seminar is a package-independent examination of the techniques required for the design of effective data base systems. The seminar covers Effective Record Design, Physical Storage Techniques, Optimum File Organization/Indexing Techniques, File Integration, and much more.

Cost for the seminar, including course materials, continental breakfasts and luncheons is $350. Additional registrants from the same company qualify for a reduced rate of $300.

New York	**St. Moritz**	**Sept. 22-24**
Denver	**Denver Hilton**	**Dec. 1-3**

Performance Evaluation and Improvement

Saul Stimler, author of *Data Processing Systems: Their performance, evaluation, measurement, and improvement* will lead this two-day seminar on measurement techniques designed to save your installation money. As well as system performance at your own installation, topics covered include: Criteria for quantifying performance, pencil and paper analysis of a system, Benchmarking techniques, Realtime, Batch and interactive time sharing systems.

Cost for the seminar, including continental breakfasts and luncheons and all course materials is $250.

New York	**Summit Hotel**	**Sept. 29-30**
Wash., D.C.	**Marriott at Wash. Int'l. Airport**	**Oct. 20-21**
Chicago	**Hyatt Regency O'Hare**	**Oct. 27-28**
San Francisco	**Dunfey's Royal Coach**	**Jan. 19-20**

How to Increase Programming Productivity

John W. Brackett, PhD, Vice President of SofTech, Inc. will lead this two-day seminar on the state of the art of Software Engineering. Under his direction you will learn how to: create more precise and visible analysis and design; reduce integration problems; improve software reliability; incorporate visible outputs into the software development cycle; increase programmer productivity; and improve programming management methods. Topics covered include: Structured programming, Top-down analysis, Design, Implementation, and Chief Programmer teams. Cost for the entire seminar, including continental breakfasts, luncheons, and all course materials is $300. Additional registrants from the same company are charged only $250.

New York	**St. Moritz**	**Oct. 6-7**
San Francisco	**Berkeley Marriott**	**Nov. 10-11**

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User Finds Itam Eases 2780-Type Emulations

By Ronald A. Frank
Of the CW Staff

NEW ORLEANS – One of the first users of the Interdata Telecommunications Access Method (Itam) is finding the software makes it easier to handle IBM 2780-type emulations.

Even though the 2780 is emulated, there are no 2780 or 3780 terminals in the communications system supported by the Tulane University Computer Laboratory.

Itam is being used by the DP center to support terminal configurations which use Interdata 716 processors and emulate the 2780, according to Lloyd Bingham, systems analyst. Several of the 716 terminal configurations, which include the processor, card reader, printer and teletypewriter, are supported by an Interdata 7/32 at the DP center.

Since Tulane is a private university, it sells CPU time to outside users, most of whom are engineering firms using the 2780 emulation to access the scientific applications software available on the 7/32.

The university DP center is a test site for Interdata equipment and this has led to some problems, according to Bingham. The center gets many of the first circuit boards produced by the vendor and hardware bugs often crop up. The latest has caused about a one-month delay in equipment upgrade plans, he said.

Generally, however, Interdata has provided good support, Bingham said, and the center is planning a mainframe upgrade soon from the 7/32 to one of the first 8/32s.

The terminals accessing the 7/32 operate at 4,800 bit/sec dial-up lines using Bell 208 modems. Much of the application includes engineering customers that use a structural analysis package developed at the DP center. It includes the design of bridges and offshore oil platforms, Bingham said.

Itam also supports a teletypewriter-type of terminal, either on a phone line or in local mode, and in the near future the center plans to test this capability, Bingham said.

Although the 716-based terminals are probably more costly than having 2780s installed at the customer sites, Bingham said the difference is justified. With the 716, a customer is able to operate the terminal in local mode and do in-house jobs as well as access the university DP center.

One customer wanted both in-house processing and high-speed transmission capabilities, Bingham recalled, and 2780 terminals would not have provided this.

While there are no 2780s in the network, emulation of this device is convenient because many firms base their systems on this type of software, he said. In addition, Interdata did not have any method for the 716 to transmit directly to the 7/32, so the 2780 mode allows the two processors to communicate.

Speaking of future additions to the network, Bingham said a Wang terminal will be interfaced to the 7/32. It will probably operate as a 30 char./sec teletypewriter-type device. There are also two TEC CRT terminals on the system and these also operate in teletypewriter mode, he said.

Although it may seem unusual to have a DP center operating with a relatively small CPU, Bingham said the 7/32 supports the necessary terminal applications and has about the same hardware processing power as a full mainframe, while there is a 10-to-1 cost advantage. "But you are software limited," he admitted.

Poor Print Quality Still Plagues Entry-Level Data Terminal Users

By Ronald A. Frank
Of the CW Staff

DALLAS – A teleprinter with acceptable print quality is still a problem for users of lower performance terminals, according to Jack Davis, vice-president of Harris Communications' Data Communications Division.

This type of device is typified by the IBM 3770 family (which recently was upgraded with higher print speeds), and the terminals in this category usually cost under $1,000/mo, he said.

In this terminal area, entry-level users first need a print speed of about 150- to 210 line/min and then, as their terminal work grows, they look for a printer that can operate at 210- to 300 line/min, he said in a recent interview.

Larger remote batch terminals, according to Davis, fall into two categories. The first handles no more than three concurrent data streams and is typified by the IBM 2780 and 3780. This unit is usually nonintelligent and the three "data streams can be card-reading, printing and communications up to a maximum of 600 operation/min."

The next level of terminal handles four or more data streams, usually with the ability to operate with dual printing or dual transmissions up to about 1,000 operation/min. Machines in this category include the Data 100 Model 78, IBM 3790 and Harris' Cope 1200, Davis said.

These terminals cost about $1,000/mo to $3,000/mo and can support multiple protocols and changing network requirements, he said.

As users' sophistication increases, high-function remote batch terminals become attractive. Also called distributed processor systems, these give the user the capability to do "concurrent unrelated operations."

These systems cost from $3,000/mo upward. Used for CRT data entry, inquiry/response and other applications, they usually include a terminal cluster controlled by a processor.

Examples are the Four Phase systems and the Harris 1600. One of the user's problems in this terminal category is deciding which system options he really needs and which he can afford, David suggested.

For the next three to five years, Davis sees printing speeds ranging from 300- to 1,000 line/min. There is a basic inconsistency on the user's part because there is a desire for faster printers, but the user typically has no plans to switch to faster data transmission capabilities. It is still less costly to have two 4,800 bit/sec lines than one 9,600 bit/sec line in most cases, Davis said.

Assuming that users will stay on their present voice grade private line facilities, at least for the next three to five years, the only alternative with higher print capabilities is buffering data so that enough is accummulated to keep up with the faster printers, he said.

Processors controlling terminal clusters will continue to improve with a trend from 8-bit to 16-bit capacities and also 32-bit controllers, he predicted.

Alden Dual-Digital Facsimile System

Alden Adds Digital Facsimile

WESTBORO, Mass. – A facsimile system capable of handling both Ascii and compressed digital facsimile signals over 3KHz phone lines has been developed by Alden Electronic & Impulse Recording Equipment Co., Inc.

The system consists of a digital facsimile recorder and digitizer at the receive terminal and a digital scanner and digitizer at the transmit terminal.

Available in either 11- or 18-in. versions, the system may be interfaced with a CPU, teletypewriter keyboard or floppy disk.

The receive terminal receives Ascii signals at rates from 1,200- to 9,600 bit/sec. At 2,400 bit/sec it prints out the equivalent of three 8-1/2-in. by 11-in. page/min over 3KHz phone lines or alternately compressed digital facsimile at the equivalent of one page in one to one and one half minutes, depending on data density.

A "quantity price" for the system would be "about $15,000," a spokesman said, with delivery in 90 days from the Alden Research Center, 01581.

Rixon Has 300 Bit/Sec Set

SILVER SPRING, Md. – Rixon, Inc. has introduced a full-duplex 300 bit/sec data set that is end-to-end compatible with the Bell 103A data set.

Called the T103A2/3, the unit is designed for two-wire full-duplex operation over dial-up lines. It has an automatic answer capability.

The solid-state modem is EIA RS-232 compatible and costs $680. Delivery is 30 days from the firm at 2120 Industrial Parkway.

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CDC 6000, Cyber 170, 70 CPUs Get Graphics System, Software

MINNEAPOLIS – Control Data Corp. has introduced a graphics terminal and software for use with CDC 6000 and Cyber 170 series mainframes.

The company also has two software packages for interactive applications on graphics terminals linked to CDC 6000 and Cyber 70 series computers.

Terminal Transactions

The terminal, called the 777-2 Cyber graphics terminal and interactive graphics system, is designed for use in advanced engineering design applications and complex manufacturing operations, primarily in the automotive and aerospace industries.

Bigger Capacity

The 777-2 is a remote terminal consisting of a console and self-contained controller that provides improved instruction capabilities, memory access time and capacity (up to 65,000 words of memory) compared to CDC's previously offered 777-1 Cyber graphics terminal.

The interactive graphics system software provides capabilities for users to create, display, rotate, store, retrieve and modify two-dimensional or three-dimensional forms, as well as enter data directly.

The graphics software programs are designed for interactive applications on a CDC 241 graphics subsystem, or Tektronix 4010/4014 series terminals connected to a CDC 6000, Cyber 70 or Cyber 170 series computer.

The first is Graphically Oriented Design and Analysis System (Godas), a modular software program for interactive and non-interactive graphics applications.

Software Routines

The second is the Low-Cost Graphics Terminal/Interactive Graphics System (LCGT/IGS), which is a comprehensive set of software routines for interactively creating, displaying, storing, retrieving and modifying graphic forms.

The 777-2 terminal includes a Digigraphics IV display console (expandable to three consoles), a fully configured, 16-bit controller with 24,000-word memory (expandable to 65,000 words), 300 card/min reader and synchronous communication interface.

Purchase price of this system is $132,000; three-year lease price is $3,050/mo. Deliveries are 30 days.

The initial fee for the standard software for the 777-2 is $800 and monthly royalty is $400. A three-dimensional option is available for an additional fee of $200 and monthly royalty of $130.

The initial fee for the Godas software is $260 with a monthly royalty of $130. The LCGT/IGS software fee is $240 and monthly royalty is $80.

Termiflex Lowers Price Of HT/2 Hand-Held Terminal

NASHUA, N.H. – Termiflex Corp. has cut the price of its HT/2 hand-held terminal from $1,570 to $995 on purchases of 100 units or more.

The firm is on Airport Road.

Data Briefs

Digi-Log Has CRT in a Briefcase

Digi-Log Portable Terminal

HORSHAM, Pa. – Briefcase portability in an interactive time-share CRT terminal is available from Digi-Log Systems, Inc.

The Digi-Log Model 209 and Model 33 telecomputers, including a 300 bit/sec modem and acoustic coupler, has been combined with a 5-in. video monitor in a briefcase. The Teletype-compatible terminal system weighs 17 pounds and is said to be rugged enough to be shipped as luggage.

Standard features include 10- and 30 char./sec switchable data rates, 64 character Ascii code set, full- and half-duplex, page and roll mode, RS-232 interface and 40 character or 80 character line length by 16 lines of display. The terminal costs $1,650, with delivery off the shelf from Babylon Road, 19044.

Tycom Offering Send/Receive Typewriter

FAIRFIELD, N.J. – An automatic send and receive typewriter terminal with tape cassette has been introduced by Tycom Systems Corp., a subsidiary of Tycom Corp.

The Tycom Model 38 KSR terminal with an Ascii-compatible Philips tape cassette unit permits data transmissions over standard telephone lines via a phone coupler. Data can be received at normal typewriter speeds, then batch processed at a speed of 30 bit/sec from the standard Philips cassette cartridge. A transmission rate of 1,200 bit/sec is optional.

Features include high-speed numerical search to locate specific data on the tape, remote control of tape from the keyboard of a standard IBM Selectric typewriter, hard-copy printout of stored data, local text editing and a status display panel for operators.

The Tycom 38.KSR with tape cassette provides economy and flexibility in performing normal administrative operations. The terminal can be used for high-speed data transmissions with computers, with other remote terminals and for personalized multiple form letters. It also can be used interactively with computers and time-sharing services and as a standard electric typewriter.

The terminal – with tape cassette unit, Selectric typewriter and telephone coupler – is priced at $4,990, with delivery in 45 to 60 days from 26 Just Road, 07006.

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Bits & Pieces

NMA New Orleans Meeting Offers Day on COM Basics

NEW ORLEANS – The National Micrographics Association (NMA) midyear meeting at the Braniff Place Hotel here Oct. 29-31 will devote a track of technical sessions to computer output microfilm (COM) and DP subjects.

Topics to be covered include "COM Data Bases," "Uncovering Hidden COM Costs," ' 'Future Trends in DP and COM" and "Unique Uses of COM."

The NMA will also offer a one-day "Fundamentals of Micrographics" seminar on Oct. 28 for newcomers to the field.

In a luncheon speech Oct. 30, Capt. Grace Hopper of the U.S. Navy will discuss the future of the minicomputer and how it will impact the DP and micrographics communities.

Running concurrently with the meeting will be the annual meeting of the NMA's Computer Image-Processing Division.

Further information is available from the NMA's conference department, 8728 Colesville Road, Silver Spring, Md. 20910.

Belts, Cartridges Color-Coded

WORCESTER, Mass. – Users can color-code their tape library with Wright Line Tape-Seal belts or self-threading cartridges now that the protective units come in six colors.

Designed for handing tape filings, the units are said to offer better tape protection, space savings compared with canisters and productivity gains through faster tape handling.

The Wright Line Tape Seal belts cost $1.75 each and the self-threading cartridges cost $2.65 each from the firm at 160 Gold Star Blvd., 01606.

Light Curtain Monitors Itself

MOUNTAIN VIEW, Calif. – The Optosafe light curtain from Scientific Technology, Inc. is an infrared sensing system that instantaneously responds when any object larger than a pencil pierces it, according to the firm.

The light curtain covers vertical planes of any height up to 20 ft wide. The transmitter section occupies a 1.4 in. by 1.75 in. unit, and the receiver section fits in a 1.75 in. by 4.38 in. housing.

Self-checking circuitry monitors the system for internal component failures, the firm said.

The light curtain costs $385/ft of height. The supporting power supply and amplifier with modular plug-in I/O options costs $595 from the firm at 1201 San Antonio Road, 94043.

Lack of Print Time Pushes User to COM

By Patrick Ward
Of the CW Staff

SALEM, Ore. – After putting two reports on computer output microfilm (COM), the Oregon Public Welfare Division saved $1,400/year in paper, storage space and computer run time. But all this was "icing on the cake" to the division.

"We were simply up against the wall," said James I. Brown, manager of the information systems unit. The department had to get monthly assistance summaries on welfare payments out to 40 branch offices for reference use. But the reports required at least 722,400 printed pages annually.

"We couldn't get the print time, even when we had our own departmental computer," Brown recalled.

Besides the continually updated monthly reports, the department also had to produce an annual report that listed all the year's payments. It took about 170,000 printed pages.

"We were always playing catch up on that particular report," Brown said, "because we never had time or there were higher priority things to do."

The report lapsed as long as a year. "It was a critical problem," he said.

The department considered an on-line inquiry system so the branch offices could inquire into a central data base, "but we didn't have that capability then," Brown said.

Instead, the department chose to contract for COM service with U.S. Datacorp of Portland, Ore. in early 1972. Instead of producing a tape and then running a print routine for its 1,100 line/min printers, the department passes the tape over to U.S. Datacorp., which returns microfiche for the branches and the archival report.

About the same time the welfare department switched the two reports to COM, it exchanged its own IBM 360/40 and 1410 for centralized DP service from the Department of Human Resources. That center has an IBM 370/155 under VS.

The change to COM processing has freed up a 16 ft by 16 ft storage room where printout volumes had been stored six ft high. The department gained other space that had been used for raw paper storage.

COM also means that, rather than having to hoist 2-in. or 3-in. volumes around, department staffers can sit at their desk and reach for microfiche sheets.

"I think it is an extraordinary benefit for the people who have to work in that (archival records) library," Brown remarked.

On the other hand, people who work with the viewers all day long do have some eyestrain, he said. "I don't think that is a substantial problem, but it does exist."

Not All Reports Adaptable

Although the department is putting additional applications on COM at "every chance we can get," Brown noted not all reports are adaptable to it.

COM is not appropriate where a person needs to have an individual piece of paper to respond to or send back, he said.

But where the information is more or less static and can be used or accessed by a number of people, there is a high acceptability for COM, he explained.

While the Department of Human Resources and other state agencies have considered setting up their own COM processing center, Brown said he wasn't sure about the status of those plans.

"You have to hire people who are qualified to do this kind of work," he said. "Recruitment might not be easy with the state's pay scales."

NBS Eyes Standard Interfaces

By Patrick Ward
Of the CW Staff

WASHINGTON, D.C. – The National Bureau of Standards (NBS) together with the General Services Administration (GSA) has begun a cooperative effort that could eventually require mainframe vendors to provide standard peripheral interfaces on the CPUs they sell to the Federal Government.

"It's very definitely an attempt on our part to actively pursue the advantage we can get in the marketplace from standardization," explained Dr. Ruth Davis, director of the NBS Institute for Computer Sciences and Technology.

Davis made the announcement together with T.D. Puckorious, commissioner of the Automated Data and Telecommunications Service of the GSA, which is the government's purchasing agency.

A 1969 General Accounting Office (GAO) study reported establishment of standard interfaces would be an important step in increasing competition in the computer peripheral industry. Added competition, the study indicated, would save the government money.

Manufacturers of high-density disk drives and other peripherals have typically had problems getting the information from mainframe vendors they need to efficiently interface their drives, Davis explained.

A standard interface would presumably decrease the costs the peripheral manufacturers face, she said.

The NBS' current program is a "revitalization of an effort that hasn't been active for a couple of years," Davis said.

Indeed, users have criticized the Federal Government, the world's largest computer customer, for not exercising more influence toward interface standards.

Part of the NBS/GSA effort will be to determine the usefulness to the government of interface standards for disks, tapes, memory, terminals and other widely used peripherals, once the technical and economic feasibility of such interfaces has been agreed upon.

The two agencies have decided to start with device interfaces for high-density disk drives. They will investigate the similarities and dissimilarities in the different mainframers' interfaces so as to learn whether a standard interface would require extensive modification of mainframers' peripheral controllers.

The NBS/GSA would have to balance off the cost of such modifications against the extra cost users would have to bear in the absence of such interface standards, she said.

"We represent the customers," Davis added.

If the NBS/GSA found a standard interface for high-density disk drives was feasible, "then we would write one," she said.

Since coming up with a standard is a consensus effort, the NBS would prefer to have the help of the American National Standards Institute (Ansi) and industry, Davis added.

The resulting standard would be required in all applicable federal procurements, but could also serve as an unofficial standard for the industry at large, she said.

In the first stage of the NBS/GSA cooperative effort, a governmentwide interagency task group is forming to prepare a study of the Federal Government's collective experience with multivendor computer systems.

All federal agencies will participate in the report and receive copies of it.

The task group will also prepare technical guidelines to assist federal agencies in planning, selecting and operating multivendor configurations.

Portable Card Punch Encodes 029/129 Set

WORCESTER, Mass. – The Model 2629 alphanumeric printing punch from Wright Line is a portable data recorder that punches and simultaneously prints characters along the top of a tabulating card.

The punch, which encodes the full IBM 029/129 character set, is operated by rotating the selector dial to the desired character and depressing the punch bar, Wright Line said. The card automatically advances to the next column after every punch bar stroke.

An optional carrying case, costing $45, holds 100 cards.

The Model 2629 costs $550 or $26/mo on a one-year lease/purchase plan from the firm at 160 Gold Star Blvd., 01606.

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Firm Keeps Up With Increasing Demand

Property Appraised More Quickly, Accurately With DP

CLEVELAND – J.M. Cleminshaw, a property appraisal firm here, has found DP can help it do its work more quickly and accurately.

And, if the trend toward more frequent reappraisals continues, DP may be the only way to get some large jobs done, according to John G. Cleminshaw, vice-president of the firm.

"There's an increased demand for computer-handled work, along with ancillary services we are able to provide from the same information such as multiple regression analysis studies and tax billing," Cleminshaw explained.

"We can provide these and, at the same time, will be able to handle the increased workload predicted for the future when reappraisal may be required every year."

In Ohio, for example, Cleminshaw noted, reappraisal is mandatory every six years. In Summit County, which contains the City of Akron, such a reappraisal can take two or more years using conventional methods.

Simpler Procedure

"Our field team, in both cases, goes out with a card and marks down the size of the property and permanent improvements that have been made and draws a rough sketch," said DP Manager Robert A. Oleksiak.

"Under the old system, our inside people needed to refer to pricing tables time after time and used a calculator to figure out the replacement value of the property."

Now, Oleksiak said, the information from the cards is fed onto magnetic tape cassettes by means of a CRT and, from the cassette, to 1/2-in. tape used by the firm's NCR Century 101 computer.

"All the pricing tables are stored by the computer system, which calculates the prices of the property and prints them out onto pressure-sensitive labels. These are inserted on the cards, which then become our customer file record."

Oleksiak said the pressure-sensitive labels make it possible to use the same file cards that were previously used.

"The old forms did not have sprocket holes along the sides and, therefore, couldn't be inserted in the computer printer," he explained. "The labels with the pricing information are just pasted over the proper area."

Copies of the sketches of the property are also made on pressure-sensitive labels and inserted onto the card.

"It formerly took us about 12 minutes to determine replacement value of a house," he noted. "If a number of homes in, say, a development were reasonably alike, we could do them in 10 minutes each. It was a very slow process."

With the NCR Century 101, pricing can be done at the rate of 100/min, while the 300 line/min printer produces 20 label/min.

"That's a fantastic gain in speed – more than 200 to 1," Oleksiak said, "and we've practically eliminated the clerical errors that used to crop up from time to time."

Cleminshaw's move to computerization came in 1971 as another try at a method that had not worked out when attempted by the company in the late '50s.

"We used a service bureau that time," Oleksiak recalled, "and it was just not a cost-effective procedure. Costs soon skyrocketed, and it soon become apparent it would be more economical for us to install our own computer.

"Ours is a nonstandard application," Oleksiak said "so we looked at a number of different systems before settling on an NCR Century 101, which offered the best price/service combination for our use."

Data Entry

Cleminshaw's operations extend over the northeast quadrant of the U.S. – New England to Nebraska. Appraisal forms or encoded magnetic cassettes from Cleminshaw field teams are either hand-carried or mailed to the Cleveland office.

The forms are entered on cassette and tape, while cassettes received from the field are put directly onto tape and into the Century 101 memory.

"For a short time we experimented with transmitting the cassette information over leased telephone wires, but found we didn't need daily turnaround. Mail or hand carrying is prompt enough for our needs," he commented.

The computer at Cleminshaw is also used for calculating and writing the payroll for over 100 employees. Oleksiak said NCR's standard payroll is used with minor modifications to take into account the fact Cleminshaw employees are working in 13 states.

Future Possibilities

For the future, Oleksiak sees great possibilities for use of computers in mass appraisals. Using specially designed forms for the field workers can speed up the work even more, he said.

"We can have the computer print out the appraisal forms, giving them to us in order of a systematic routing," Oleksiak pointed out. "We are also looking into direct optical scanning of the field documents to eliminate having to punch the data into a CRT terminal."

Reappraisals should be cut down to a matter of months with computer techniques.

"We can do a sampling of recent sales, and some background follow-through to make sure our sample represents the true market value of the property sold," he explained.

"Using these methods, a reappraisal, where all the base data is recent, should take only a few months. And the computer will not be occupied for all that time. Much of the work is in selecting out data from the computer to use in figuring additional information."

Both Oleksiak and Cleminshaw see the use of computers as a more efficient use of manpower.

"By getting the information more quickly and more accurately while providing the option of reappraising every year, we can help property assessed valuations more accurately reflect true values. And that can only lead to better tax equalization," Cleminshaw concluded.

"We generally shy away from software houses, but with DATACOM we're glad we made an exception," he continues. "The efficiency of the DATACOM monitor has more than paid its cost—a competitive monitor would require twice the computer resources we're now using. What's more, from the day it was installed, we've been able to add application after application with ease. And with DATACOM, the transition from DOS to OS was smooth.

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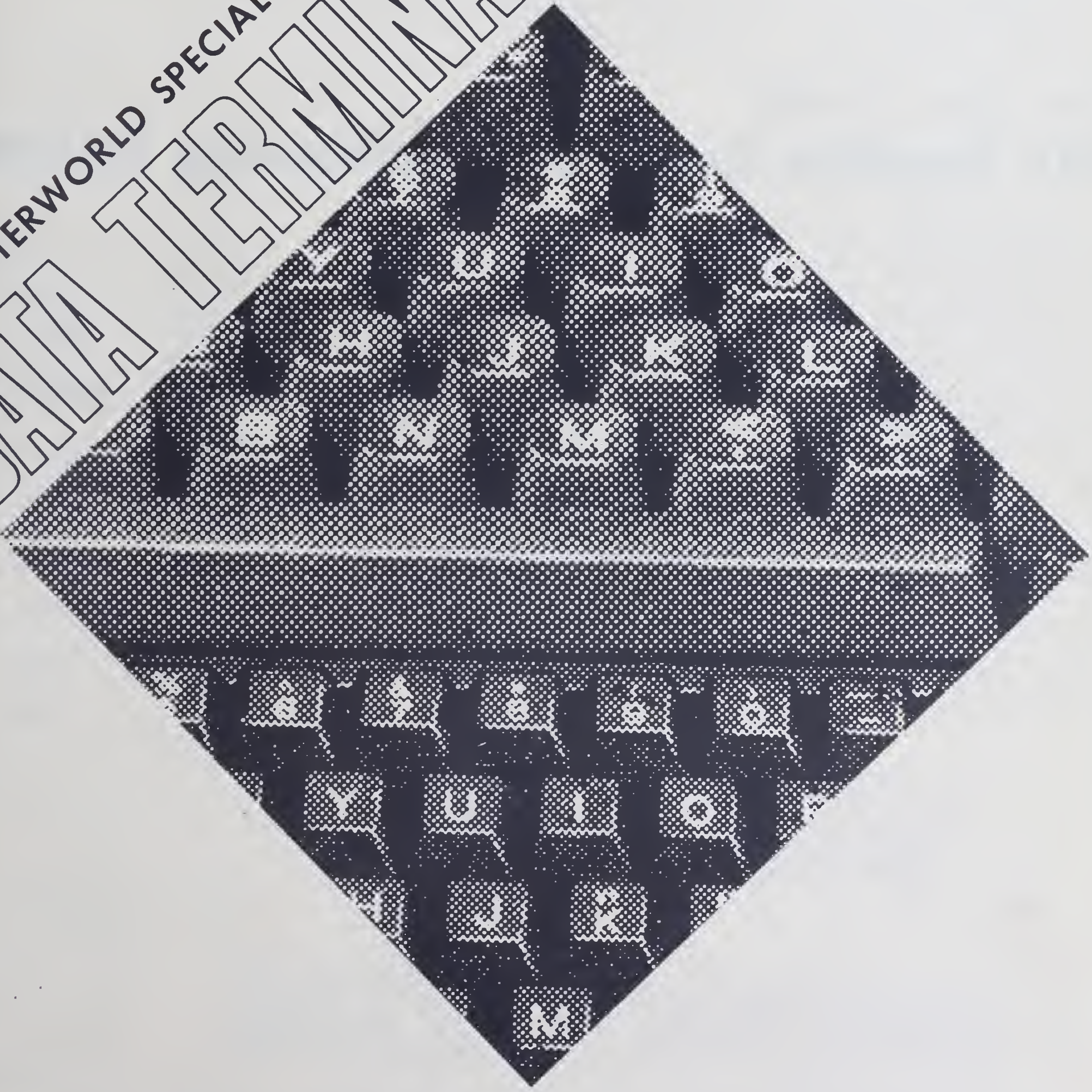
A COMPUTERWORLD SPECIAL REPORT JULY 30, 1975

DATA TERMINALS



Making Life Easier

By Ronald A. Frank
Of the CW Staff

Data terminals are taking on new characteristics designed to make life easier for the user/operator.

More and more terminal systems are being designed as vehicles to solve specific application problems. These application areas cover both horizontal and vertical areas of importance to users.

A typical horizontal area is data entry, which cuts across many industries, while a vertical area would be supermarket checkout terminals.

Regardless of the environment in which the terminals operate, there are some common trends. The most noticeable is an attempt by the supplier to simplify the operator's interaction with the machine.

In vertical systems, control keys are labeled with terms familiar to the operator; many of these actually trigger multiple functions within the intelligent terminal. Keyboard arrangements have been designed to take into account the frequency of hand movements, and oft-used keys are now larger and more accessible.

Displays have been made easier to read, even in brightly lit rooms. While some of the early CRT screens did not show up in some lighting, today's displays have white on black, black on white, blinking, underlining and other methods to set off data and make it easily recognizable.

Terminals are moving out to the source of data collection, where more and more operators have very limited keyboard experience. Many experts believe additional man-machine interface simplification holds the key to widespread terminal usage.

From a systems standpoint, terminals appear to be going in two directions at once. On the one hand is an attempt to provide multifunction terminals so

(Continued on Page S/6)

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This special report was prepared by Ronald A. Frank, CW's associate editor/Technical News.

Allows Greater Versatility

SNA Simplifies Design of Teleprocessing Systems

(Continued from Page 1)

at the destination of a message, communicate with each other.

Each sending element accepts the data unit from its predecessor in the path, adds the parameters and instructions needed by its counterpart in the next node and passes it to the next element.

Each receiving element uses the information intended for it and passes the remainder of the message along to the next receiving element.

Structuring a system into layers permits changes in one layer without affecting the others. Although a network usually consists of a number of nodes, Figure 1 has been simplified to show only two.

The application layer performs the user's application processing; it need not be involved in the protocol or procedures for controlling a communication line or transmitting messages.

The function management layer monitors data being received, chains together data units, regulates data flow and provides a number of support services for the application program or operator.

Examples of these services are formatting of data for display or printing, buffer management and configuration and error-recording services.

A feature of the function management layer is the concept of network addressable units. These are logical entities implemented in the control code of the host, cluster controller and terminals that can be separately addressed. These entities are the origins and destinations of messages flowing in the communication system.

Network addressable units are temporarily linked during "sessions" to transmit data. Certain parameters are proposed by the initiator and accepted or rejected by the receiver. Examples of these parameters are the SNA commands to be used, whether responses are expected and definition of responsibility for recovery from error conditions.

The transmission subsystem layer manages the routing of messages. It is divided into three elements: transmission control, path control and data link control.

Transmission control identifies origins and destinations and sequences messages. Path control selects the links over which messages are sent. Data link control manages the links and handles link error control.

Figure 2, a simplified structure of network nodes and message formats, shows what happens to a message as it travels between network addressable units.

SNA does not require giving up existing products or application programs. Users can retain their old terminals, or communication controllers, which can coexist in an SNA environment, making migration easier. Old terminals can run on binary synchronous and start/stop lines, which are supported by IBM's communication controllers and access methods.

The 3704/3705 communication controller supports the attachment of SNA cluster controllers and terminals through the NCP/VS option and supports attachment of old terminals through the emulation program. Coexistence of both types is provided through the Partitioned Emulation Program (PEP).

SNA terminals are supported by the Virtual Telecommunication Access Method (Vtam) and various support programs operating through Vtam. Old terminals are supported by the Btam, Otam and Tcam Access Methods. These Access Methods can coexist in a single host.

Another form of coexistence is available for users of support programs such as CICS/VS or IMS/VS. These program products provide support for old terminals as well as the SNA products.

Broughton is a member of the teleprocessing staff at IBM, Raleigh, N.C.

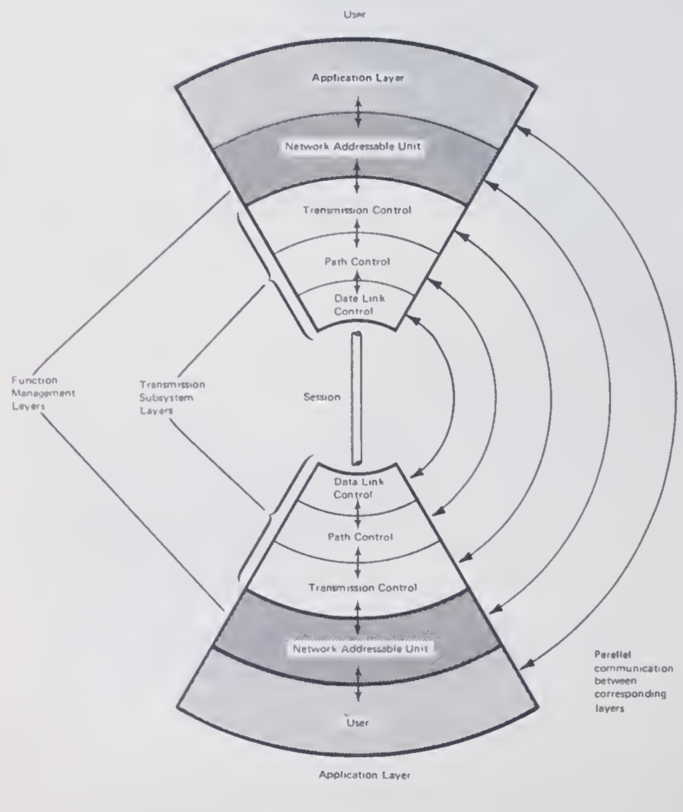

Figure 1 SNA layers, showing communication between layers and the major elements in the Transmission Subsystem Layer

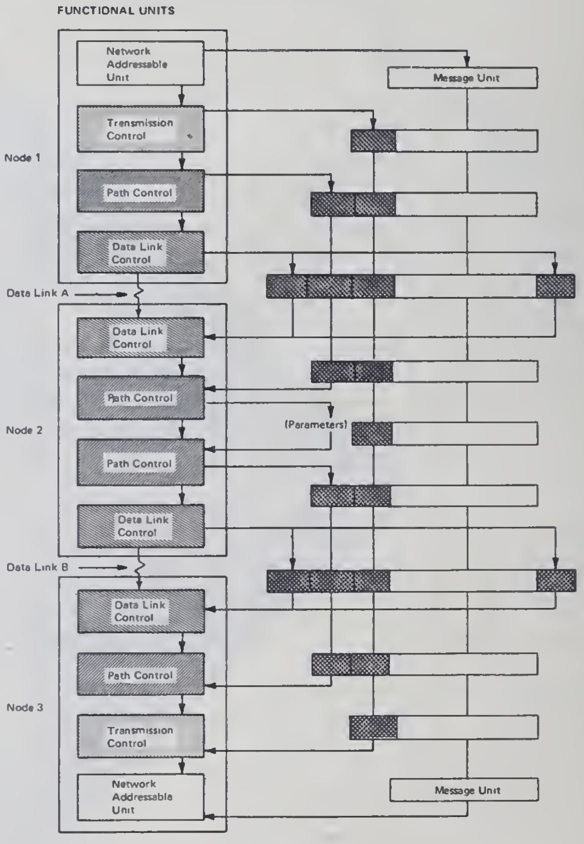

Figure 2. Flow of control data through the Transmission Subsystem layer

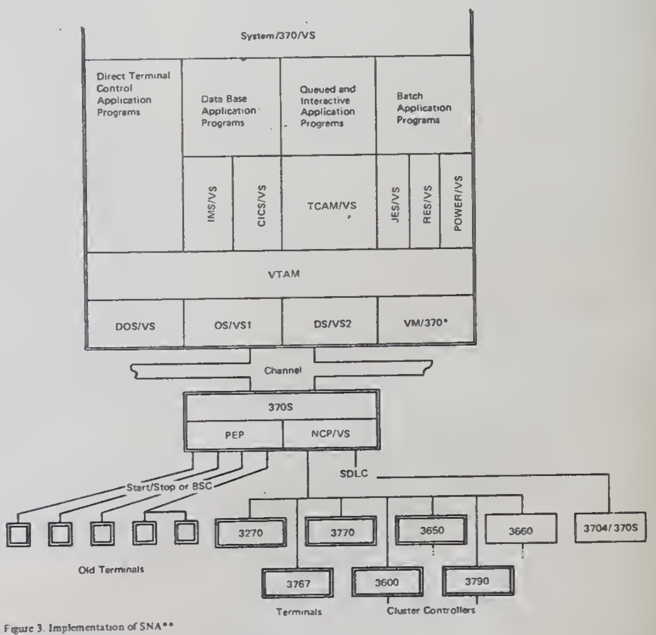

Figure 3. Implementation of SNA**

*OS/VS1, OS/VS2 or DOS/VS in a virtual machine under VM/370

**This figure shows conceptual relationships; it is not meant to imply all combinations are possible.

Bank Finds Simplicity Key to Success

Special to Computerworld

CHICAGO – A bank has found a wide range of applications for a terminal that can be used as a stand-alone system or in areas where a full-size CRT terminal would not be economical.

Harris Trust and Savings Bank reached this conclusion a third of the way through a six-month trial of Plantronics/ Comset, a 64-character CRT terminal that is hooked up to a standard push-button telephone. The Comset gives computer terminal capabilities to a regular phone.

"We see this as a minimal information-access device, one that can be put into both teller and management areas," Richard L. Zimmerman, an assistant vice-president at Harris Bank, said.

"We feel it will not replace full-size CRTs, but rather expand our information retrieval system so data can be provided when and where it is needed throughout the bank," he added.

"We will always have a need for the capabilities of a small display system like the Comset, not only to supplement the larger CRT network, but to enable us to distribute information economically to a wide range of management functions."

Zimmerman is a manager in the Harris' Systems Research Division, where computer systems, software and hardware are studied to evaluate and design applications for the bank.

The bank used an audio response system in conjunction with a Burroughs B5500 computer for internal communications until it expanded its computer system with the addition of a B6700. That's when bank officials first became interested in the Comset.

"Because of the age of our audio response equipment," Zimmerman explained, "there was a serious question about whether to convert the equipment to put it on the B6700."

Trial Period

While bank officials were considering a solution, a representative of the Illinois Bell Telephone Co. asked Harris Bank if it would be interested in trying the Comset. After a demonstration, the bank agreed to a three-month to six-month trial involving 25 units.

The terminal, supplied by Plantronics, Inc., Santa Clara, Calif., provides direct access to a computer through a standard push-button telephone. The phone is used to call the computer, receive a recognition tone, enter a code such as an account number and enter or receive data.

The Comset transmits at 300 bit/sec with a built-in modem. At the CPU, dial-up Plantronics modems are used. Each terminal cost "less than $50/mo," including modems and maintenance, Zimmerman said.

The Comset displays data on a 64-character CRT screen. As soon as the data transmission is completed, the telephone is available for regular calling. The terminal is available from telephone companies throughout the nation on a monthly rental basis.

For the Harris trial, the 25 Comset terminals were installed in areas that represented a cross-section of the bank's activities. Thirteen units were placed in the management areas that needed regular access to a data base such as the Deposit Accounting Division; the other units were placed in teller areas of the bank.

Checking accounts were programmed for access, providing the current balance, available balance, date of the last deposit, a stop-payment indicator, signature card, microfiche number and account number. Plans are currently under way to add credit card information, commercial loan information and savings information.

Implementation Easy

Bruce L. Cleland, systems officer for Harris Bank, found the Burroughs B6700 "well-suited" for implementation of the Comset.

In addition to the normal data communications hardware required for the B6700, Cleland said, the only other equipment used for Comset were Burroughs B6650-1 asynchronous line adapters.

Two pieces of standard software were also used: a Network Definition Language (NDL) and a slightly modified Message Control System.

"The only consideration made in the application programs was the placement of data communications control characters," Cleland added. "A control character is placed at the beginning of each message; this clears the Comset screen and homes the cursor.

An 'ETX' is placed at the end of each message from the application program. The Burroughs data communications processor scans this and recognizes the end of the transmission and automatically disconnects the lines. This minimizes the line time."

Harris Bank concluded that Comset offered several advantages over the audio response system, and Zimmerman believes the terminals' abilities have wide applications in financial institutions such as Harris Bank.

"Our philosophy is the majority of requests for data are specific pieces of information, and the majority of users aren't interested in seeing a CRT screen full of data about an account," he said.

"For instance, when a customer comes to a window and wants to cash a check, the teller doesn't have the time to go through 1,800 characters of data to find out if the balance on that account will satisfy the demands of the check.

The teller wants to know specifically what the balance of that account is. The Comset is a device that will give it to the teller efficiently and quickly."

A teller at Harris Trust and Savings Bank awaits the signal to verify a customer's check on a Comset CRT terminal.

Twelve of the 25 terminals that were used by tellers during the trial were located on service counters so several tellers would have access to each unit. The Comsets handled up to 800 inquiries a day during the trial period, and bank officials concluded the system saved them

(Continued on Page S/26)

Granted, our new ADM-3 is basic. Especially if you compare it with all the smart video terminals around (our ADM-1 or -2, for example). But the $995 unit price puts it into a different perspective.

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Arizona DP Manager Uses RJE as Path to User Control

PHOENIX – "Theoretically, I would like to get to the point of having users control everything."

Coming from Jack Stanton, manager of automated systems for the Arizona Department of Transportation (DOT), these words are like a progress report on the growing use of remote job entry (RJE) in every DOT location.

Full-Service Bureau

Stanton's group functions as a full-service bureau for DOT, the state government's largest single department.

At the beginning of the 1974-75 fiscal year, Stanton was given the assignment of absorbing a 25% increase in work flow through his computer center, which houses an IBM 370/145 and a 370/158 – with no increase in personnel.

He did it with a systems approach to DOT's overall DP needs and resources. One outgrowth of the analysis was a 139% increase in the number of jobs entered via remote terminals from DOT's administrative and engineering offices dispersed throughout the state.

Today, about half of DOT's 10,000-plus batch-processed jobs per month are handled automatically with RJE. Stanton said he thinks, with no new technology, he may be able to bring the ratio up to 60%.

Keeps Morale, Productivity High

He feels the main benefit of RJE is putting input and output functions close to the users at remote locations. This keeps their morale as well as their productivity high, Stanton said, and the cost savings are good news in the perennial budget battles.

"We have increased our workload by 25% per year for the past two years. We did this without having to add people at the computer center because RJE has a negligible impact on job control. Without RJE, we would have had to double our control personnel to get the 25% increase," Stanton said.

Jack Stanton, Arizona state DP director, is a strong believer in remote job entry.

Stanton's group is budgeted for 85 people in operations, development and systems services for the fiscal year that began July 1. This is nine fewer than the previous year, even with another projected 25% increase in workload.

The Arizona Highways Division, Stanton's biggest "customer," is organized into seven districts. The DP mix at each district office includes jobs relating to highway maintenance, new construction and design – along with normal administrative functions.

Computer Machinery Corp. (CMC) CMC/Remcom 2775 remote batch terminals are installed at six of the district offices and one office has a CMC/Remcom 2780. The 2775 terminals have 400 card/min readers and 135 line/min printers. The 2780 handles 400 card/min and 480 line/min.

DOT has a CMC/Remcom 2775 at the right-of-way planning office in Phoenix, and the exotic photogrammetry and mapping operation uses a CMC/Remcom 4780 intelligent terminal for program development and input/output.

Another CMC/Remcom 4780 helps print mailing labels, maintain circulation lists and process orders for DOT's *Arizona Highways*. This promotional magazine has more than 500,000 subscribers throughout the world.

DOT budgets a total monthly rental of slightly over $10,000 for its 11 CMC/Remcom systems.

Mike Houle, district DP liaison person, uses a CMC/Remcom 2775 remote batch terminal for engineering and administrative data input from the Phoenix district office.

All RJE batches come into the computer center via leased lines at rates from 2,400- to 19,200 bit/sec. As a government agency, DOT has access to General Services Administration Telpak private lines, which considerably reduces communications cost.

Divided Work Load

At the computer center, Comten 3670 communications control units divide the work load between the 145 and the 158 host computers, communicating with both concurrently.

Stanton's commitment to remote terminals isn't limited to remote batch jobs, although the CMC units account for about 30% of monthly rentals. A total of 142 terminals of all kinds are used.

Many of these are CRT typewriter units used interactively in just about every DOT activity, including on-line motor vehicle registration (still being phased in), engineering and programming development, budgeting, administration and text editing.

Arizona has been a pacesetting computer user since its days with a Univac 120 in 1955.

Stanton is satisfied with his third-party IBM mainframes and plans to upgrade the 145 to a second 158 later this year. But he has no qualms about picking an independent vendor when he knows he can get an acceptable price/performance package.

So his shop has the Comten communications control units, Memorex disk drives, CMC remote batch terminals, a CMC 18 shared-processor data entry system and keyboard terminals from Harris, Trendata, IBM, Western Union and GTE.

5 × 15 + 12 = $135 per mo.
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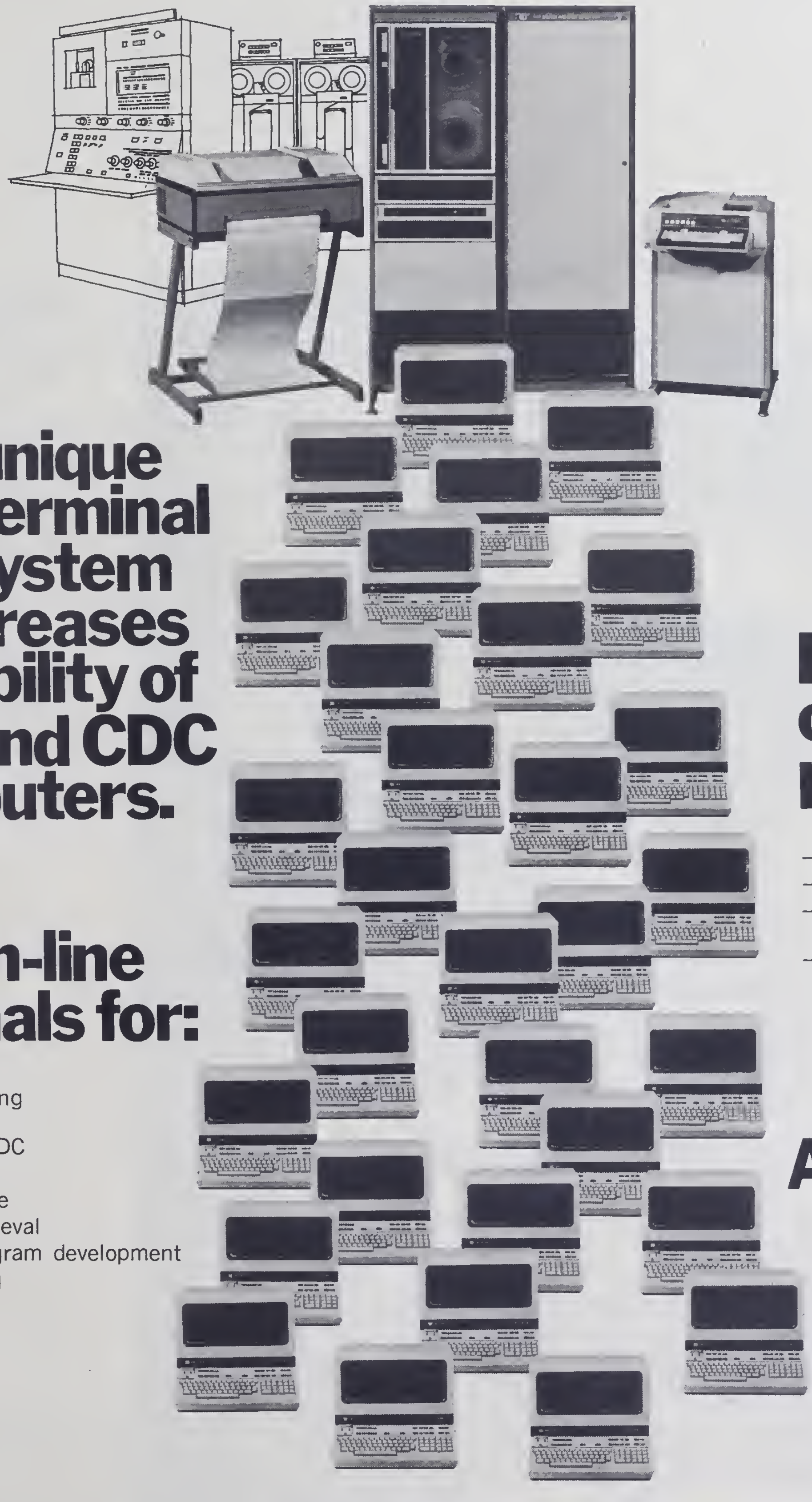

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Distributed Processing Facilitates Same-Day Shipping

NEW ORLEANS – A disk-oriented distributed processing system, featuring intelligent CRT terminals, enables Aeroquip Corp. to make same-day shipments on any of 120,000 items from among its plants and warehouses across the country.

Howard Selland, advanced systems manager at Aeroquip, said a typical remote warehouse application uses Sanders 810 disk systems and each is part of Aeroquip's international teleprocessing network.

The Sanders systems, installed at 12 domestic locations; Toronto; and Baden-Baden, Germany enable personnel at remote plants and warehouses to maintain their own customer and inventory data base, perform sophisticated order processing locally and communicate with the central processors and data files when necessary.

In addition to its Sanders terminals, Aeroquip could be described as having a model mixed site. The 370/158 operates under VS2 and includes the Intercomm teleprocessing monitor from General Telephone's Programming Methods subsidiary.

IBM's Btam and Tcam access methods operate under Intercomm with Tcam supporting an in-house IBM Time-Sharing Option (TSO) system.

There are two front ends – an IBM 3705 operating in 270X emulation mode and a Memorex 1270. Peripherals on the 158 include 22 Itel 3330-type disks and two IBM 3330-11s all of which store the company's data base and operate under the Total data base management system from Cincom.

The network includes both dial-up Wats lines (about 80%) and private lines with speeds of 9,600 bit/sec. It includes a link to Germany that is multiplexed to support four Data 100 remote batch terminals which emulate IBM 2780s.

There are also several 4,800 bit/sec lines operating with International Communications Corp. and Bell 208 modems.

Other terminals include Raytheon PTS-100s, IBM 3270s, and, in Toronto, Vu Com Ils supplied by Bell Canada. There are 17 Sanders terminal subsystems operating under Hasp and emulating IBM 2780s, each with a controller and disks, and three or four Sanders CRTs, Selland said.

An additional two Sanders subsystems will be added by October. The firm also intends to add the IBM 3850 mass storage system and move up from release 1.7 to release 3 of VS 2.

Centralized Product Base

Aeroquip, a subsidiary of Libbey-Owens-Ford Co., maintains a master data base at Jackson, Mich., consisting of all inventories, customers, vendors, etc., which permits the company to track all orders through an entire cycle from initial order entry to accounts receivable processing.

The Sanders 810 systems, each with a 5-million-character disk file, microprocessor and up to two printers, perform off-line during the day at remote sites.

Operators display and fill in order forms and store them on the disk which contains the formats and programs for validating each order. In addition, local customer and product information is also contained in the disk file.

Making Life Easier Aim of System Design

(Continued from Page S/2)

that the user need no longer acquire separate terminals for each application.

On the other hand, there is a trend toward supplying terminals specifically designed to operate in one specialized applications environment. The two trends may be complementary, however.

The multifunction systems offer potential savings to companies in which terminal networks evolved as specific needs arose. Each of these systems is often tailored to one type of terminal used for one purpose and nothing else. It is not unusual to see a separate inquiry/response terminal situated next to a terminal used only for data entry.

Some recent systems offer the user an opportunity to combine functions with obvious cost savings. Many of the earlier systems are underutilized and operating during only a portion of the business day. By having multifunction terminals, the user may be able to reduce the amount of equipment in use and cut down on parallel communications lines at the same time.

The key to successful operation of the new terminal systems rests with the processors that control them. In some cases, dual processors are used, but in all systems the processor serves a varied role. It acts as the network interface for the terminals, which often must talk to central mainframes, other remote sites, etc.

Often the processor performs protocol and other translation functions, so that the man-machine interface can be functional with the more complex procedures being used to transmit edited and batched data to the mainframe's data base.

The processor often includes a large disk or other storage capability that collects data being input from individual terminals. Most important, the processor or controller acts as the single interface point for the network.

If the network can talk to the controller, it means the terminals operating behind the controller are automatically part of the system. This will be the major method of attaching "plug-compatible terminals" to tomorrow's teleprocessing nets. As long as the controller can understand the necessary protocol, network architecture, access method or other system constraints established by the mainframe vendor, the specialized terminals will have access to the network and data bases operating on it.

All this means more efficient terminals that are operational a greater portion of the day. No longer are general-purpose terminals being acquired for later adaptation to application problems.

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Technology Having Profound Impact on Communications

By C.B. Young

Special to Computerworld

New technology is beginning to have a profound impact on data communications terminals.

Terminal types, the number of terminal equipment manufacturers and the variety of user options have been increasing at an unprecedented rate.

All signs point to a continuing proliferation as designers take advantage of the rapidly advancing technology to develop solutions to customers' communications problems.

To see what's happening and where terminals are going, let's start by reviewing the components of a terminal.

A typical terminal might consist of a keyboard, a cathode ray tube display, a printer, either a tape cassette or a disk if intermediate storage is required and several other pieces and parts, as illustrated in Figure 1.

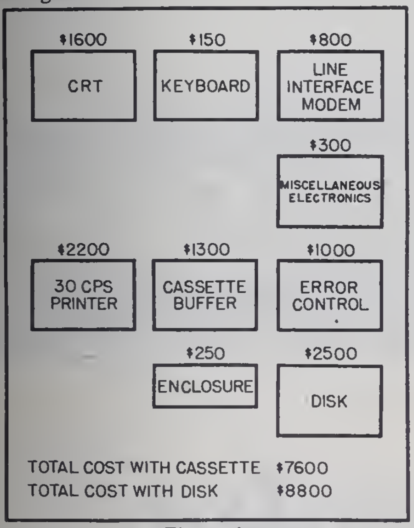

Figure 1

If a user wanted to buy these as individual components, say in quantities of 1,000, he would have to pay $8,000 to $9,000 per set. Today, that cost figure makes many possible applications uneconomical.

Why such high costs?

If some of these units are broken down into more basic components (Figure 2), we see each has certain elements peculiar to the particular device, for example, a CRT tube, a printer mechanism, a tape deck and so on.

Each has its own power supply, and, finally, there is the logic that makes each unit functionally what it is – provides it with its intelligence.

As indicated by the approximate cost figures, the logic to provide each unit with its intelligence is the biggest cost item in each unit.

The total cost of a sophisticated data communications terminal that provides the functions offered by these devices can be reduced considerably if the basic elements can be combined in an integrated design having a common power supply and some common control logic (as indicated in Figure 3), with as little logic as possible dedicated to individual components.

Today, this is feasible using microprocessors – computers on integrated-circuit chips – with stored-program logic recorded in a combination of read-only memories (ROM) and read/write (more often referred to as random-access) memories (RAM).

After adding some input/output (I/O) circuitry, an enclosure and some kind of error-control, a total cost of less than half the previous cost figure can be projected for a terminal incorporating both a disk and a cassette and having the capability of performing additional functions because of the "intelligence" it can have in its stored-program memory.

How will new technology affect data communications terminal design?

Terminal technology can have an impact on four different areas:

- Operator interface – how a terminal communicates with people.
- Storage media – how a terminal stores information (data and control).
- Line interface – how a terminal communicates with other machines.
- Control logic – how a terminal derives its "intelligence."

Operator Interface Important

Of the various interface devices, the most common element is the keyboard, a relatively simple device, not likely to be changed drastically in the near future, but which will be improved from the standpoint of reliability and with regard to human factors, the things most important to one of the key people in any system, the operator.

CRT displays are coming down in price, but are still relatively high-cost devices and they require high voltages and suffer from high power consumption.

Gas-discharge displays such as Nixie tubes, Self-Scan and Palenplex, are lower in cost but are alphanumeric only. Unfortunately also, they are not compatible with state-of-the-art integrated circuits (without extra interface electronics). However, one manufacturer expects to have a unit within 12 to 18 months that is compatible.

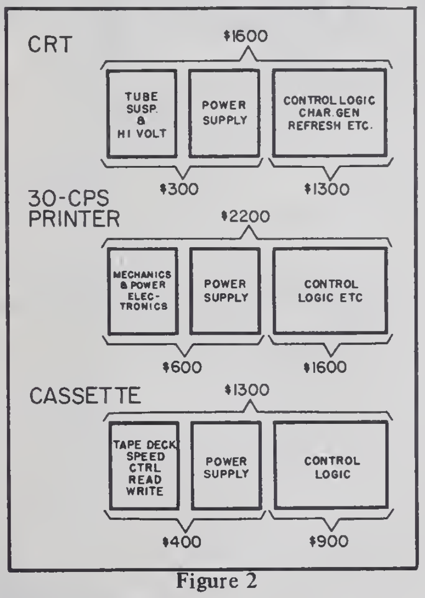

Figure 2

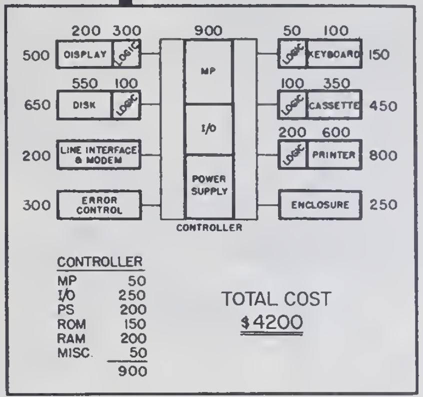

Figure 3

Progress is also being made in flat scanning displays, with one now being capable of displaying up to 280 lines.

Light-emitting diodes (LED) require low power and can be used to provide spots of light for indicators or even matrix-type readouts. They are now available in three colors: red, green and yellow.

Liquid-crystal displays are the newest devices on the scene. These elements change color or reflectivity in response to tiny currents. Some wristwatches already have liquid-crystal digital readouts. These devices have the lowest power consumption of any display available, because they use incident light rather than light they generate; but, for the same reason, they have the poorest visibility and, of course, cannot be used in the dark.

Character printers are moving to higher speeds. Four or five units operating at 120 char./sec are already on the market. Matrix printing technology is beginning to reduce the cost of medium-speed (300 char./sec) printers.

No astonishing developments can be foreseen in thermal or ink-jet devices in the near future; hence, their application will probably continue to be limited.

The greatest advances will probably come from use of xerographic techniques. This approach offers the possibility of very high speeds, say up to 4,000 line/min.

In storage media paper tape is still with us as an old, useful workhorse. Many operators feel comfortable with it, and some probably will continue to prefer paper tape until a handy way to read "spots" on magnetic tape is developed.

The Philips-type magnetic tape cassettes, however, are replacing paper tape in many large-volume data-collection applications. Cartridges offer higher reliability and are provided by a number of vendors, for example, 3M, Teletype and Tri-Data.

Tape reels are used in a few terminal applications, especially those in which transfer of data, off-line, to or from a CPU is desired. The quality of the tape used is still being improved. New iron-oxide coating which recently became available will allow up to 1,600 bit/in. recording density (with a 10^{-7} soft-error rate) in cartridge packages and up to 6,000 bit/in. in reel applications.

Fixed and replaceable magnetic disks are used in only a few terminals requiring the storage of very large volumes of data.

These are being challenged and new applications are developing for the flexible or "floppy" disk, a sheet of magnetic tape material in a protective cover, much like a phonograph record. These can store up to 2 million bits.

In suitable units, they can operate with a 200-kbit transfer rate, with less than a half-second average access time.

Such disk handlers with basic interface electronics can be obtained for under $800 each in quantity, and the disks sell for $5 to $10 each, making them competitive with cassettes.

They do have an operational disadvantage as compared with the fixed-type disks, since reliable operations is limited to about 10,000 accesses.

Magnetic cards are still around but no interesting new developments seem likely.

Core memories still fill about 70% of the computer mainframe market, but they have seen few terminal applications to date other than where minicomputers are used as controllers. They have remained cost-competitive through automation of production and by use of new techniques which provide multiple flux levels, permitting storage of more than one bit per core, so future terminal equipment usage could increase.

Some military applications still favor use of plated-wire memories because of their high noise immunity. This usage amounts to perhaps 4% of the total memory market. There seems to be little likelihood of any significant usage of this storage medium in data terminals.

The biggest area for development, however, is in the relatively new field of solid-state memories. Read/write memory elements made using metal oxide semiconductor (MOS) technology yield high-capacity memories with speeds in the range of 300 nsec (0.3 μsec for a 4-kbit unit costing less than 1 cent per bit.

Bipolar semiconductor devices yield higher speeds and have been made in units of up to at least 10 kbits. Schottky-diode-clamped transistors also provide good noise immunity and speed characteristics.

All of these devices, however, are volatile; that is, the stored data is lost if power is turned off. Their use is, therefore, generally limited to scratchpads, temporary data storage and control logic involving program modification and overlay techniques.

Read-only memories, used to store control logic and semipermanent data, avoid this problem by having the memory contents permanently or at least semipermanently recorded.

(Continued on Page S/9)

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Impact of Technology on Communications Profound

(Continued from Page S/7)

Some of these are "mask programmable;" that is, the memory contents are determined by one of the photographic masks used in manufactur of the device.

Others are programmed electrically by burning out links inside the device. Some types are reprogrammable; the contents of the memory can be erased, say by exposure to ultraviolet light for five or 10 minutes, and new data can be recorded. A few recent types are called "electrically alterable" or "read-mostly" memories.

This means the data at a given memory location can be changed electrically by signals lasting in the range of seconds – not suitable for the usual types of read/write applications, but not volatile either.

The latest and most promising development, however, is with metal nitride-oxide semiconductors (MNOS), which seem to offer the distinct possibility of a read/write, nonvolatile, high-speed solid-state memory.

Progress in this area should be prominent in the technical news journals in the next few months, and the availability of such devices at reasonable cost will definitely affect the design of data communication terminals.

Back in the laboratory stage, meanwhile, are a number of exotic new developments: magnetic bubble memories, holographic memories using lasers, magneto-optic devices, amorphous semiconductors and other new techniques expected to yield very high capacities in small-size elements.

New serial memories for mass storage using charge-coupled, charge-transport techniques will have medium-speed capability at low cost.

While it may be quite a while before some of these ideas work their way down to the terminal equipment market, solid-state memory devices are moving lower and lower in cost, replacing other types of memories in more and more applications.

Line Interface Critical

In the area of line interface we can expect to see many new developments. Today we have the modem on a card, which permits a variety of arrangements, and recently a modem on a chip was announced. With the new analog and hybrid integrated circuits in development, we can expect to see more elaborate control electronics designed into line interface modules in the near future.

With the advent of new digital services which will be widely offered by the common carriers, the modem will be eliminated and a new (hopefully) simple interface will be the standard arrangement.

A lot of changes have come about since transistors in hard-wired control logic circuits replaced vacuum tubes and made relays obsolescent. Combinations of transistor logic circuits in small plug-in units called Dual In-line Packages (Dip), made in metal-oxide-semiconductor (MOS) structures, provide designers with building blocks for assembly of complex logic circuits at low cost. But this is being supplanted in many applications by medium-scale- and large scale integration (MS/LSI) packages containing up to 3,000 or more components in one unit.

Complementary MOS (CMOS) units now being offered use much lower power than MOS, but have lower speed. The latest development is silicon-on-sapphire (SOS), which combines low power consumption with high speed.

An intensive effort is going on in super-density chip design – the most advanced techniques permitting up to 17,000 transistors and resistors on one 0.3-in. by 0.3-in. silicon substrate.

A 16-bit by 16-bit multiplier circuit made in this fashion has yielded an operating time of 350 nsec.

A recent design element, growing in application, is the programmable logic array (PLA). To the logic designer, PLAs are somewhat analogous to microprogrammable design techniques for the computer designer; that is, by taking standard packages and "coding" them properly, the logic designer can make his equipment perform a variety of functions by use of common building blocks.

Combining more and more elements into smaller packages reduces costs significantly, but at the price of loss of flexibility. All features are, truly, cast in silicon. However, these MSI/LSI techniques have now resulted in the microprocessor or "computer on a chip."

When combined with memory and interface logic, microprocessors can be used as a replacement for or a supplement to the minicomputer at a very significant reduction in size and cost and with very good flexibility to change features and provide options.

These devices today have the power of computer mainframes in use back in the mid-1960s.

Instruction execution times are now in the range of a few microseconds, but they are coming down and units have already been announced that will operate in less than a microsecond.

Improvements Significant

What does all this mean to the user in terms of improvements in terminals? First, it's going to mean significant reductions in the cost of the more sophisticated types of terminals – not in the Model 33 class, but in higher speed terminals and those having some kind of intelligence.

Hardware costs are coming down, in some areas more than 20% per year. Applications that can't justify a specialized terminal now will be proved in by utilization of the new technology.

Also, with a stored-program design, additional operating features and function can be added at a little increase in hardware costs.

Of course, offsetting the decreasing hardware costs to some extent are increasing software (or "firmware") costs. These applications or terminal programming costs will be going up as more advanced features and functions are incorporated into the terminals.

The stored-program controller, however, can be a general-purpose design customized to meet a particular set of requirements. It can grow or be modified.

It can swap programs and emulate different terminals or handle different applications such as order entry (with operator prompting and error checking), report generation and/or printing. And it can be changed to meet changing requirements or entirely new needs that cannot be foreseen today.

Young is a staff member with Western Union Data Services, Mahwah, N.J.

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In Distributed Teleprocessing

Multifunction Terminals Foreseen

By James W. McNabb
And Robert L. Reis
Special to Computerworld

Distributed teleprocessing systems have evolved quite rapidly in recent years. One simple way to envision such a system is as the process of communicating with computers through remote intelligent terminals.

YESTERDAY'S NETWORK WITH "DUMB" TERMINALS

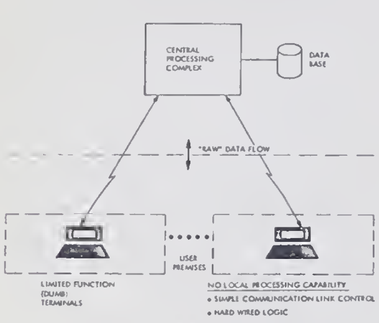

CENTRAL PROCESSING COMPLEX
DATA BASE
"RAW" DATA FLOW
USER PREMISES
LIMITED FUNCTION (DUMB) TERMINALS
NO LOCAL PROCESSING CAPABILITY
• SIMPLE COMMUNICATION LINK CONTROL
• HARD WIRED LOGIC

FIGURE 1

Teleprocessing, as such, is any form of information handling in which a DP system utilizes telecommunications facilities. In fact, teleprocessing is involved wherever DP "power" or computer services of any type are provided to remote users over a telecommunications network.

Distributed teleprocessing systems, in effect, interconnect "local" processing capability with remote central processing complexes.

A brief review of the evolution of distributed teleprocessing systems is in order. In the beginning, and even today, nonprogrammable terminals such as teletypewriters communicated with a central processing complex over either a dial-up or dedicated communication link, utilizing a simple form of communication link control.

In effect, raw data flowed between these "dumb" terminals and the central processor, as there was no local processing capability. This situation is portrayed in Figure 1.

The situation today is substantially different, as Figure 2 indicates. Programmable "intelligent" terminals communicate with a multiapplication central processing complex.

TODAYS' NETWORK WITH INTELLIGENT TERMINALS

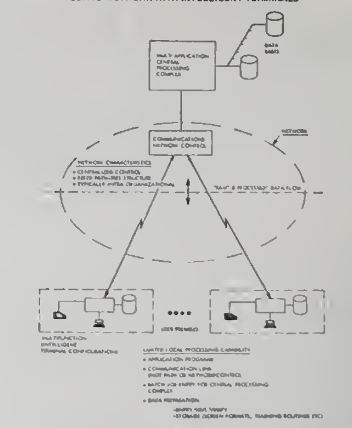


FIGURE 2

Quite often, companies use a number of these terminal configurations with each terminal communicating over a fixed path-type of network centrally controlled via a communications controller associated with the central processing complex. Both raw and processed data flows between these terminals and the central complex.

Most of today's intelligent terminal configurations have useful but limited local processing capability. Application programs are usually developed by the user but, to an increasing degree, packaged application programs are available.

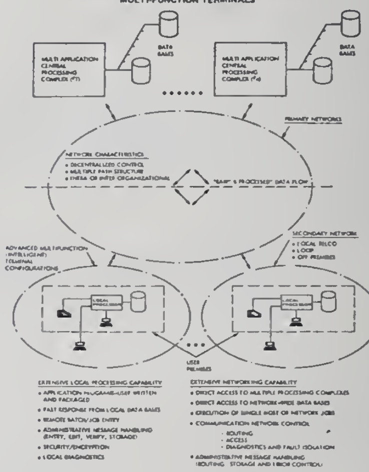
Basically, these terminals are used interactively with reasonably sophisticated data preparation which might include entry, editing, verification, storage (including screen formats), training routines and so forth. Some of these terminals are used for limited off-line processing as well as remote job entry.

Future Systems

Figure 3 illustrates some of the basic concepts for tomorrow's distributed teleprocessing systems. There will be several

(Continued on Page S/11)

TOMORROWS' DISTRIBUTED TELEPROCESSING SYSTEM WITH MULTI-FUNCTION TERMINALS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• LOCAL DIAGNOSTICS
EXTENSIVE NETWORKING CAPABILITY
• DIRECT ACCESS TO MULTIPLE PROCESSING COMPLEXES
• DIRECT ACCESS TO NETWORK-WIDE DATA BASES
• COMMUNICATION NETWORK CONTROL
· ROUTING
· ACCESS
· DIAGNOSTICS AND FAULT ISOLATION

FIGURE 3

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Terminals Foreseen As Multifunctional In Teleprocessing

(Continued from Page S/10)

multiapplication central processing complexes involved.

A typical user will utilize his intelligent terminals for many functions. It will evolve that the most cost-effective way to access appropriate data bases will be to "go where a particular data base resides," as opposed to installing all desired data bases at one central processing complex.

To achieve this, a terminal will require access to what can be called a primary network, either intraorganizational or interorganizational, with decentralized control and multiple paths. Similar to today's environment, both raw and processed data will flow through these primary networks.

As noted in Figure 3, the secondary network will interconnect a variety of individual terminal keyboard-type equipments to a local processor.

This secondary network will encompass the interconnection of terminals within a building, an industrial complex or even an entire community. It could be configured conventionally utilizing local telephone company facilities, or it could involve a more cost-effective loop (video cable) system.

These multifunction terminal configurations will have far more extensive DP and communications capability than intelligent terminals of today. They will have extensive networking capability along with packaged application programs which will have proliferated from many sources.

Simple data analysis, editing, formatting, sorting, encryption and error control, all may be built into the terminal of the near future.

Fast response from "locally" available data bases will become an important feature of these terminal configurations.

Remote job entry and administrative message handling will continue to be significant applications. Local diagnostics will also take on a greater degree of importance.

Security Important Factor

One new area becoming increasingly important to the success of multifunction terminals is security. Many people are convinced that local control of a data base permits a greater degree of security.

To a large extent, they are correct; however, success in the overall distributed teleprocessing systems market will have to include an acceptable degree of remote data base security utilizing varying degrees of encryption techniques.

The expanding influence of microprocessors, which will be an integral part of the new multifunction terminals, will result in terminal manufacturers selling more complete processing systems for the local computing requirements. The total-

(Continued on Page S/21)

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Acceptance of Intelligence Growing

On-Line Evolution Keeping Pace With Batch Advances

By Paul Lavoie

Special to Computerworld

As the on-line segment of the terminal area continues to evolve, innovations and developments have been introduced that parallel the advancements within batch terminals.

Intelligence, for instance, which has been an accepted part of the batch business since 1970, is gaining increased acceptance in the on-line area, as well.

At first glance, it seems redundant to have the mainframe perform edit checks on data which has already been preedited by a remote display station. After all, a significant investment has been made in software, bringing up packages like CICS, IMS, Btam, as well as various other applications programs – programs designed to handle inquiry/response and data entry tasks from remote locations for payroll, order entry, accounts payable and receivable and a host of other tasks.

By the judicious use of intelligence at the source, however, users can transmit error-free data down the line, requiring little, if any, editing at the mainframe. The result: fewer error messages being transmitted back from the CPU to the remote display stations and a reduction of traffic on the lines.

The key is, of course, that, while the mainframe could accomplish these editing functions, an intelligent terminal can catch the error while the CRT cursor is still positioned at the spot where the error occurred, eliminating time-consuming cursor positioning after a computer returns a screen containing errors to the display station.

In addition, it is possible, with random-access memory at each display station, to store a number of formats at each station. The operator can, therefore, call the CPU in the morning and gather all the formats he would need during the course of the day and store them in the memory.

They could be assembled by a bootstrap loader so he could call the format upon request and enter the data for eventual transmission to the CPU. This local storage capability reduces the number of inquiries to the CPU and, therefore, reduces line loading.

At a time when many users are trying to upgrade their CPU to keep pace with the growth of their communications networks, intelligent on-line terminal users are finding they can, indeed, hang more terminals on a given line because of the lower line utilization intelligence affords.

Another recent advancement in the terminal market is one that appeared on batch-oriented IBM terminals in 1972 – the flexible disk. It can be expected that several manufacturers of on-line CRTs will incorporate the floppy disk in the 3270 emulation offerings.

This on-site storage capability permits users to continue keying data during CPU, line or modem outages, storing the data on disk for subsequent transmission to the CPU when the CPU, line or modem is restored to operation.

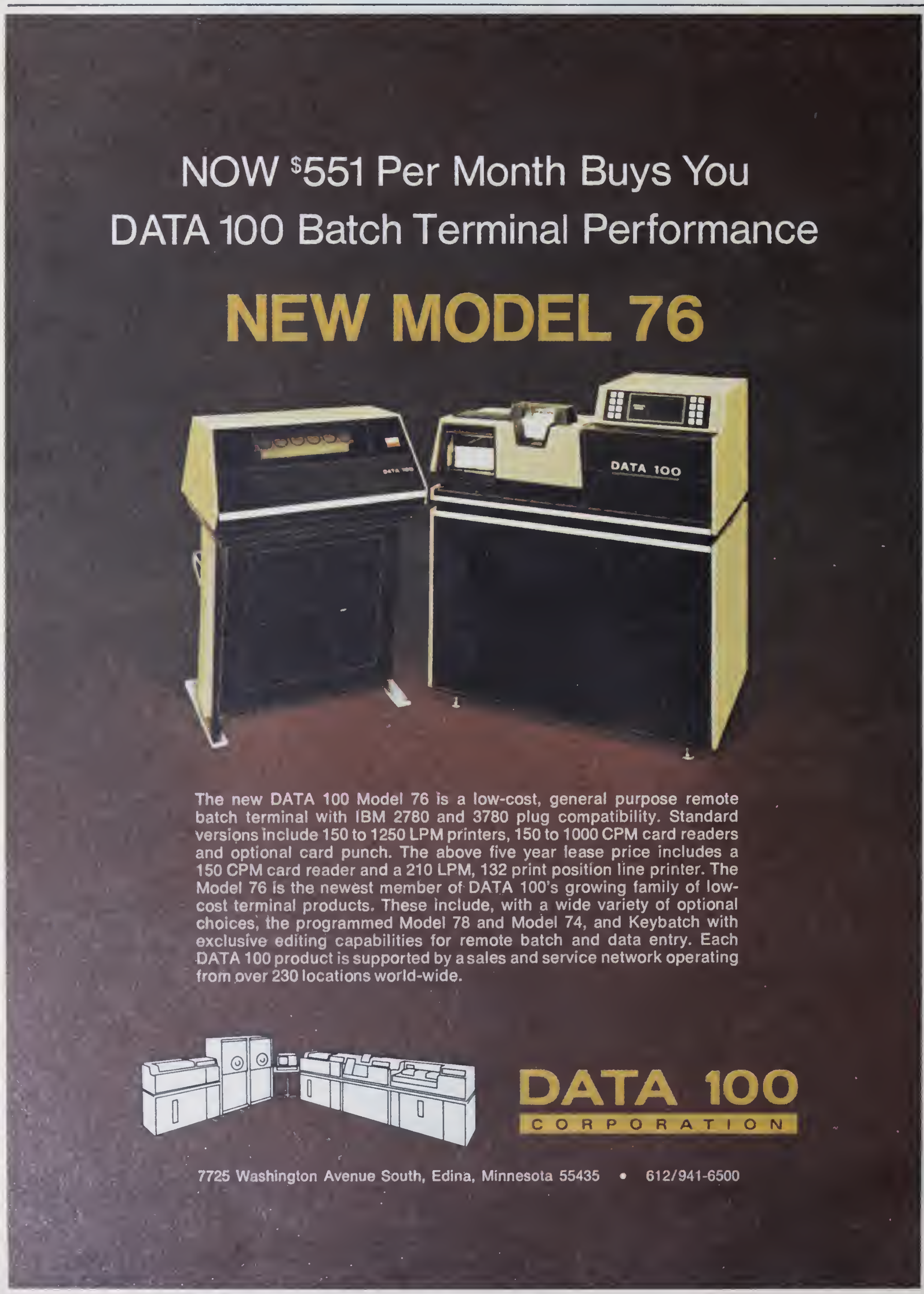
Those formats which are too large to be stored in random-access memory at the terminal may be stored on diskette for later call-up by the operator, once again reducing line traffic as a result of fewer requests from the display station to the CPU.

Auxiliary Storage

Another application users have cited is the auxiliary storage of noncritical data at the on-line terminal site in off-peak hours or at night when the communications network is in relative low use. Peak loads may also be reduced in print applications by the unattended transmission of CPU-processed data to the disk in the evening for printing the following morning.

Developments such as those recently introduced into the market serve a many-fold purpose for the user – they permit the expansion of the communications network without necessarily increasing transmission rates, permit more efficient use of the network, reduce CPU loading and provide the user at the source with flexible tools for the implementation of source-unique applications packages.

Lavoie is vice-president for marketing at Sycor Corp.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Redundant Hardware Ensures Reliable Communications

By Stuart B. Cooper
And Arvind N. Patel
Special to Computerworld

The rapid growth in data communications coupled with the dependency of major corporations on reliable, sustained data transmission has in many instances necessitated the purchase of redundant hardware. Typical users of data communications hardware are:

- Time-sharing service utilities.
- Message store and forward systems.
- Reservation systems.
- Message concentrators.
- Management information systems.
- Inventory control systems.

In general, a communications system is comprised of four categories of hardware component subsystems, CPU, peripherals, communications line controllers, and common carrier facility and user terminals.

The central processor unit consists of a mainframe, a memory, a real-time clock and a control panel.

The peripherals may consist of a mass storage unit, a magnetic tape unit, card and paper tape equipment, line printers, ASR, etc.

The communication line controller may include communications line multiplexer and associated line interfaces or single line controllers.

Common carrier circuits and user terminals are considered external and remote components of the system.

The essential design criterion for a reliable communications system is that no single component failure can cause the entire system to fail.

An extremely reliable system with an effectively continuous 24-hour-per-day, seven-day-per-week operating system can be achieved by providing backup capabilities. These requirements demand the vital components be backed up by providing redundant components in a system.

Some of the components of a communication sýstem, depending on application of the system and function of the component within the system, may not be utilized on a full-time basis.

Hardware Cost Increase

Redundant hardware is generally provided at a considerable increase in hardware cost, for the purpose of protecting a system or network against a component failure causing the system or network to become inoperable.

The costs to the user associated with system downtime or performance degradation as a result of a component failure will determine the degree of system redundancy required.

The cost considerations must include such intangibles as good will and user confidence in the equipment as well as money. Redundancy requirements will therefore vary from user to user.

Levels of redundancy can vary from dual equipment to the sharing of required system equipment, with some degradation of performance when used in the equipment-sharing mode.

Multiple component failures within a system or network can render the system inoperable if the failures should occur simultaneously in the primary and backup equipment.

Since the probability of this occurring is very low and protection against it very costly, this possibility is generally not provided for when configuring a system or network.

Certain components, e.g., a line printer used to generate daily activity reports need not be redundant. A failure of a line printer would delay the report printing operation in this particular application until the printer is repaired or replaced. In a batch processing environment, the line printer is a critical and vital component of the system.

Failure Detection

There are various ways to detect a failed system component. For instance, perform checksums on received and transmitted messages to detect communications line troubles and perform parity checks to detect memory and I/O bus problems.

A technique to detect an operational failure is via a watchdog timer retriggered periodically by the software. Failure to retrigger the watchdog timer can initiate recovery procedures. In some situations, the recovery procedure may be an automatic reload and restart of the program. A recovery procedure of this sort generally requires down-line load capability or disk-resident software. This type of corrective action requires a key-in-loader in a protected portion of main memory (e.g. read-only memory). The down-line load procedures permit timely recovery from many erroneous states caused by hardware or software failures without manual intervention.

Automatic detection of an AC power failure should be incorporated into the power supply subsystem. Upon detection of a power failure, an interrupt is generated to the processor to initiate the power fail recovery procedure.

By providing an intercomputer communication link between the on-line and backup processors, possible problems in either system can be detected by mutual interrogation.

Thus, corrective action could be taken and serious loss of precious computer time minimized.

If the backup system is used for off-line processing and/or software enhancement purposes, that function may be delayed until the on-line system is again operational.

Upon rectification of a failed system, it is essential to restore the system back into a normal mode of operation without interrupting the current job processing. The reintroduction of the system back into service should not have any impact on the user.

This feature of a redundant system, called dynamic reconfiguration, permits the addition and removal of CPUs and other hardware from operation for maintenance purposes.

Switching Equipment

The switching equipment is the most vital component of the system and is to be structured for easy and quick repairability. There should be sufficient spare

(Continued on Page S/14)

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Significance of Reliable Communications Growing...

(Continued from Page S/13)

parts and/or switches available on the site to allow rapid repair.

The switching of redundant equipment between minicomputer systems is generally accomplished via relay or logic switches. Each method has its advantages and disadvantages.

The logic switch permits signals to be repowered at the switch before being passed through the cable to their destination.

In larger systems, this can provide increased flexibility in locating the common option cabinet or cabinets relative to the mainframe cabinets. In nonstandard options, the switches may possibly be designed into the option, minimizing the cost of the switch.

Logic switches also eliminate the problem of floating signals and provide the opportunity to affect or control the state of certain signals during the switching operation.

However, logic switches also introduce some skew and delays in the signals passing through the switch which may be intolerable to the system's standard timing. The reliability of equipment is reduced as additional circuitry, which can fail, is added.

Logic switches also need constant power, requiring careful consideration in locating the switchable options and associated switches. The advantages gained in repowered logic signals may be negated by this consideration.

Also, any additional power supplies required during on-line operation of the logic switch and associated option adversely affect the reliability of the equipment.

Relay Switch

The relay switch introduces no additional skew or delay in the logic signals that pass through the switch. If latching-type relays are used in the switch, no power is required by the switch during the on-line operation of switchable equipment.

As a result, a switch-related power failure will not affect the system operation except during a required switching operation. The switch power supply could, therefore, be replaced at a convenient time without having any effect on the on-line system operation.

The overall reliability of a relay type of switch can be expected to be greater than that of the logic switch. Pluggable relay switches are also more flexible in that the same switch can be used for switching peripheral equipment or logic controllers and can be easily changed in case of a switch failure.

Of course, the relay switch has the disadvantage of floating signals that can be susceptible to noise and cross talk. In addition, overall cable lengths are limited to that capable of being driven by the switchable equipment and associated processor.

In the final analysis, the type of switch chosen to provide the required redundancy will have to be made in accordance with the factors related to the system in question.

The switch-over of peripherals and communications lines may be automatic, manual or under program control. One of the classical methods of automatic switch-over is to let a watchdog timer initiate the switching.

Both computers are equipped with watchdog timers which are serviced by the associated software. Failure to service the watchdog timer causes time out of the timing chain indicating a malfunction in the computer. The watchdog timer initiates switching of peripherals and communications lines to the backup computer and interrupts the backup computer to indicate a failure.

To confirm the on-line computer is indeed down, the backup computer may interrogate the on-line computer via a communication link between two computers. This procedure provides rapid recovery with minimum interruption and is usually implemented in hot-standby or warm-standby systems.

The manual switch-over procedure is less expensive and requires operator intervention. Therefore, it is recommended in applications where slower recovery from failure is acceptable.

The watchdog timer mechanism is utilized to sound an alarm instead of initiating automatic transfer. The operator may manually switch over the peripherals and communications lines to the backup computer.

In shared-load systems, one computer is servicing communications lines and the second computer is performing other foreground/background tasks.

In peak load conditions when response time slows down, it is necessary to provide capabilities under program control to switch over some communications lines to the second computer.

In these situations, programmable switch-over provides uninterrupted service to users without degradation of performance.

Typical Redundant Systems

The level of redundant hardware provided is dictated by the period of system downtime that can be tolerated by the user. Accordingly, different types of

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...Redundancy Protects User Against System Failure

(Continued from Page S/14)

users require varying degrees of redundant equipment and system interaction.

Time-share service utilities and data entry and collection systems using minicomputers are examples of systems that will generally not prove to be very costly to users when periods of a few hours of system outages are encountered.

In systems such as these, elaborate and costly approaches to avoid periods of system inoperation are generally not cost-effective.

Some time-sharing service utilities incorporate magnetic tape units to provide backup for both the system software and user files in the event of a catastrophic system or disk (head crash) failure.

User files are preserved on magnetic tape and are updated at the discretion of the user, resulting in user recordkeeping savings as well as protection against accidental or malicious destruction of important data.

In the event of a failure, the user has the option of continuing processing when the system is restored from the point at which the failure caused the processing to be discontinued.

This is accomplished by additional time-share software designed into such systems to insure active files are not lost at the time of a failure, thus significantly reducing recovery time.

Users of this type of equipment can generally tolerate some interruption in service without incurring serious financial losses. Therefore, the funds required to expand system backup beyond that noted here would be difficult to justify.

Data Entry and Collection

A multipoint network system configuration, for example, illustrates two levels of redundancy requirements. The system consists of dual processors with its own disk units. Both processors are linked via an intercomputer communications unit which can be used to maintain a mirror image of all the transactions on the disk drives associated with both systems.

The CPUs are each equipped with a single line controller to provide a communications link to a host computer.

A multiline communications controller for connecting user terminals to the computer is provided on each CPU for redundancy purposes.

The system components thus far described are fully redundant.

To provide complete system redundancy, each CPU should also be equipped with line interface units switchable at the modem level. This configuration will double the hardware cost of interfacing each line and increase the cost of switching equipment significantly.

Having added a significant amount of switching hardware augments the probability of a switch failure.

A less reliable but lower cost technique for switching communications lines can be accomplished by switching connections between the multiline controllers and associated line interface units.

This approach, however, makes the line interface units the most critical hardware associated with the system.

Certain failures in a line interface unit can render the group of communications lines associated with the failed line interface unit inoperative.

This problem can be partially solved by providing two groups of line interface units and carefully dividing the communications lines between them.

This approach can be rationalized on the basis of substantial reduction in redundancy of costs and higher mean time between failures (MTBF) and lower mean-time to repair (MTTR) of the smaller line interface groups.

A failure of a line interface unit may, at best, result in half the communications lines being out of service for a short period of time.

This may not be catastrophic since the terminals are generally located close together enough to permit the user to walk to another terminal associated with the operational group of line interface units.

Switch-Over Decisions

The redundancy decisions generally address what will be switchable – individual peripherals between dual CPUs or entire systems including peripherals and communications line interfaces – in the event of a failure.

While the latter choice may be less expensive from a computer hardware point of view, the former will result in less system downtime by reducing the frequency of system switch-over as a result of a failure and fewer message queues formed ,while the network waits for the back-up system to come on-line.

This is true because a failed peripheral device or associated controller can be switched to the redundant system for repair while its redundant counterpart is switched on-line with minimal effect on system operation.

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(Continued on Page S/17)

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Redundant Equipment Ensures Against System Failure

(Continued from Page S/15)

disks or magnetic tape devices are sometimes duplicated by being concurrently placed on a redundant disk or magnetic tape device (mirror image).

This requirement can result in the switching of peripheral equipment between redundant CPUs, being the more economical approach, as the number of expensive redundant storage peripherals may be fewer than is required in the unswitched peripheral approach.

This is especially true when the redundant system is primarily used for off-line processing when both systems are operational (cold standby).

Under these conditions, only one redundant peripheral device of each type required must be provided, instead of the multiple devices required in identically configured systems.

When both processors are dedicated to the primary function of the system (hot standby), such that the off-line processor is tracking the on-line processor and performing redundant peripheral storage operations, the unswitched redundant approach may be the more economical.

Network Reliability

Having successfully achieved high reliability in the network termination points or nodes, each capable of handling many terminals and concentrators, attention must be turned to the reliability of the communication network itself.

Failure of a communication link can result in all terminals associated with that link being unable to access the system for an unacceptable period of time.

For single terminals such as CRTs, redundant communications links may not be cost-effective.

However, for multidrop or polled links, concentrator links or links to message store and forward systems, a communication line failure in the network can have a seriously adverse effect on a large number of system subscribers for the duration of the failure.

Links operating at 9,600 bit/sec or less that terminate at attended sites and cannot tolerate excessive periods of downtime should incorporate a dial backup capability to improve the reliability of the link.

There are many techniques available for incorporating dial backup capabilities in a system.

One common technique is a multidrop link with dial backup on a per-station basis.

Regardless of the choice, this is one less costly method to improve the reliability of a medium-speed network than redundant dedicated links.

Network data exchange of 50,000 bit/sec and greater must be made over dedicated links.

In order that the network be capable of sustaining communications between all operable pairs of nodes, at least two independent paths between all node pairs must be provided.

So that maximum network reliability and effectiveness can be gained, the following criteria should be met.

- Communications throughout the network must not be disrupted upon the failure of a link or node.
- The total circuit mileage for geographically distributed users must be kept to a minimum.
- The sharing of network nodes and links to minimize throughput delays should be incorporated.

A distributed message switched network such as the Arpa net, in which network control is decentralized so a link failure will not disrupt communications for the network subscribers, is a good example of an effective and reliable network.

Each intermodem processor (IMP) in the Arpa net pays strict attention to the performance characteristics of its circuits so that if a circuit appears to be failing, information can be rerouted through alternate paths. Message exchange routines continue between IMPs so that, when a failed circuit is restored, it is automatically put back into service.

Data in groups of 1,024 bits, called packets, arrive at the destination IMP in no particular order, since each packet has been subjected to varying routing decisions and error-correcting retransmissions.

As the packets arrive, they are reassembled into a host message. The dynamic selection of routes, employing the sharing of the network resources, contributes to providing maximum data throughput with a minimal response time.

The need for redundant systems is ever increasing.

Today business and industries are much more dependent on computers and, therefore, the cost of outages can be significant when compared with the cost of backup equipment.

The level of redundancy requirements in a system is determined by the application of the system.

The computer user is most knowledgeable about the application of his system and should, therefore, be able to identify the critical functions requiring backup capabilities.

Cooper and Patel are with the Honeywell Special Engineering Department, Framingham, Mass.

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Nets Major Factor Influencing Terminal Development

By E.D. Spater
Special to Computerworld

Terminals evolve under the influence of many factors, one of the newest being the advent of computer networks.

Before getting into details of how terminals have been changing, I want to define what a terminal is in terms of its functional components – where the changes are most apparent.

If a terminal is broken down into its various functional components, it is similar to the computer as viewed by the DP manager. The terminal consists of six basic functional components: a controller, a storage medium, an input device, an output device, a communications controller and a line interface.

Computers without communications capability would not have the line interface or communications controller.

The terminal controller is the device's "glue." By glue, I mean that element which ties all other components of the device together into a specific type of terminal.

No component part of a terminal defines the functional capabilities of the terminal more than the controller.

The input or output devices may be similar in a simple teleprinter terminal and a complex intelligent terminal, but the controller varies greatly.

In the simple teleprinter, the controller may consist of a series of simple relays and some basic electronics, while the intelligent terminal may require something as powerful as a minicomputer or at least a microprocessor for a controller.

The communications controller and the line interface are the components that turn this device into a terminal. Without these two components, the device may be utilized for any number of things other than a communications terminal.

The line interface, physically and electrically, connects the terminal to the communications line and converts the digital signals of the terminal to the analog signals required by the communication lines.

The communications controller logically interfaces the terminal to the device (terminal or computer) at the other end of the communication lines.

If the communication controllers associated with each of the devices at the end of the communication line are functionally identical, the devices may converse with each other. I say "may converse" only because functionally identical communication controllers do not ensure terminal compatibility.

A common example of incompatibility in similar terminals involves semantics. While there are many terminals which communicate utilizing what is known as "asynchronous, 103, 110 bit/sec line protocol" or bi-sync, 202, 1,200 bit/sec line protocol, they may still be incompatible with each other due to their use of different languages.

One terminal may be conversing in Ascii and another in Ebcdic. Although the two languages are similar, they are not identical and, therefore, many problems will arise if the two terminals attempt to communicate with each other.

There are even cases when two terminals, both conversing in Ascii code, encounter problems because there are various versions of Ascii.

Let it suffice to say line protocol is a fairly complex area and should be approached cautiously.

The storage medium is the terminal's memory and may vary in size and type as drastically as the controller varies from a simple teleprinter to a complex intelligent terminal.

While all terminals require some type of storage, the media used and number of characters stored may range from a simple teleprinter terminal storing a few characters in some basic electronic circuitry to the new floppy disk memory systems capable of storing a quarter of a million characters. There are even terminals available utilizing standard disk systems capable of storing millions of characters.

Five basic types of storage devices available today are solid-state electronics, paper tape, punched card, magnetic tape and magnetic disk.

The important factors to consider when looking at storage devices are:

- Size (how many characters it can store).
- Speed of access (how fast data can be retrieved).
- Removability (whether data can be saved indefinitely).
- Flexibility (whether data can be worked to fit one's needs).
- Cost.

While magnetic tape is probably the least expensive medium in pennies per character of information, this is not true if you require only one or two hundred characters of storage.

You cannot, of course, decide on what type of storage is necessary without reviewing all factors pertaining to your specific functional requirements.

I/O Devices

The most important components of a terminal are the input/output devices. These I/O devices are the man-machine interface. Unless understood by the operator, they will, at a minimum, reduce productivity and, at a maximum, lead to a total breakdown of the system.

Output in most terminals consists of either printed material or a display. In some cases, a combination of both is used as in most point-of-sale terminals where a visual display and printed copy are part of the terminal's capabilities.

The type of output device used is determined mainly by whether you require printed output or not and then by what volume of output data is necessary.

Since most display terminals today are limited to approximately 6,000 characters of storage, a requirement of greater volumes of output is one factor which may force one toward the use of printers.

Input devices can be a major problem if not considered at their proper level of importance when designing a data communication system.

While the total terminal may be considered the man-machine interface to the computer, the input device of the terminal is the man-machine interface to the system.

Three Solutions

There are three basic solutions to this potential problem. The first is to remove the human operator completely by interfacing the terminal directly to the information-generating source.

(Continued on Page S/20)

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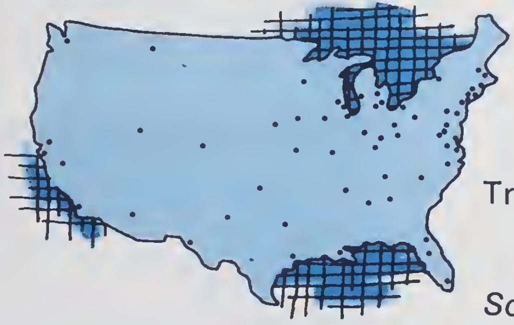

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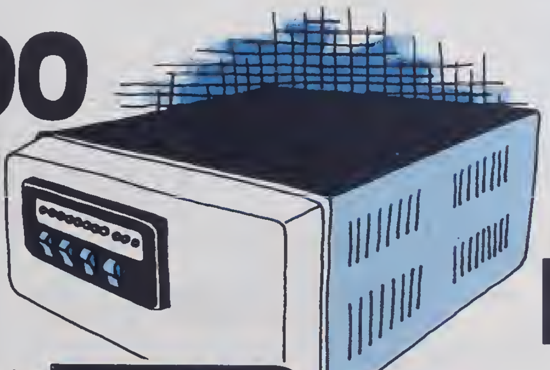

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Many Factors Affecting Development of Terminals. . .

(Continued from Page S/18)

The second is to train special operators to handle all transactions requiring the utilization of the terminal.

The third is to obtain a terminal with an input device similar to the device or devices normally used by the part-time terminal operator.

Direct interfacing can only be used in special cases where the information is being generated by a machine. Special operators are being used very successfully by many organizations having enough entry volume to justify a full-time operator.

Solution number three, using familiar devices, is by far the most commonly used. The input device most generally emulated is the typewriter keyboard. The second most generally emulated is the adding-machine keyboard. There are also many terminals that supply both.

An accountant or bookkeeper who must enter numerical data primarily into a terminal will be far more efficient on an adding-machine keyboard than on a typewriter-keyboard. A secretary who must also perform as a part-time terminal operator will be more productive on a typewriter-type keyboard.

Since the acquisition industry seems to be moving toward capturing information close to the source, the use of part-time terminal operators will be increasing. The use of a familiar input device will decrease training costs, increase input efficiency and decrease input errors.

Factors Affecting Terminal Features

The major factors affecting terminal features are:

- Technological advances.
- Competition to and tariff charges within the common-carrier companies.
- Increased knowledge in the area of communications software.
- Modified approaches toward the solution of system problems.
- The general economic picture pertaining to all aspects of data communications.

The term "cost-effective" will never be ignored in any area of the communications field.

In the area of technological advances, the general trends are to make more functions available at a reduced cost and improve the performance of the terminal components at the same price or lower.

Improved performance is exemplified by the various types of printers available in the marketplace today compared with five years ago.

Teletype Corp. has announced a new printer capable of printing at four line/sec or 240 line/min. Not too many years ago, the best Teletype could offer was a 10 char./sec printer (approximately eight lines/min).

Great strides have also been made in the area of storage devices. The mid '60s offered users inexpensive terminals limited to paper-tape storage and expensive terminals with punched-card and magnetic-tape storage.

The breakthrough came with the utilization of cassette units capable of storing 50,000 to 100,000 characters on a small, inexpensive cassette. Today almost all terminal suppliers offer a cassette of one type or another with their terminals.

Just recently, a new magnetic medium was announced, the floppy disk. This device is capable of storing 250,000 characters and gives the terminal tremendous potential in data accessing and manipulation. There are many end-user terminal suppliers, including IBM, offering this device.

The second factor affecting terminals in general is the Siamese twin of the terminal industry, the common carrier industry (consisting of companies which supply communication lines and are regulated by the Federal Communications Commission (FCC).

For the first time, some serious competition has entered this field, and the results have been some interesting manipulating of the tariffs by AT&T. These new tariff changes include a change in the Wats tariff, a new high/low tariff and a new Dataphone Digital Service (DDS) tariff.

The DDS offering by AT&T will have a very strong future effect on terminals. This network, designed specifically for digital communications, will allow for higher speed communications at lower prices.

The network will also not require a data set, the terminal-to-communication-line interface, thereby reducing the terminal's cost to the user.

AT&T is also talking about a dial-up version of the DDS network. This directional trend toward higher speeds at lower prices will have a substantial effect on future terminals.

In the early '60s, digital communications was in its infancy. Today about 45% of the computer sites rely on some kind of communications network. This increase in the utilization of communications has created a new specialist in programming, the communications specialist. As more of these specialists are developed and gain expertise in communications, they will lose the fear of redoing vendor software.

This independence of the end user will allow him greater latitude in choosing the terminal system which best solves his problems. It will also allow the independent terminal suppliers greater freedom to supply what is best for their users' needs and not what is compatible with computer manufacturers.

This general increase in knowledge across the total spectrum of the communications industry should develop greater freedom for all parties involved.

Because of technological advances, tariff changes and increased knowledge, the various system approaches for solving communications problems will be modified.

The best solution to the problem of data acquisition has been known for years. That solution is to capture the data as close to the source as possible.

Centralized data preparation can cost as much as a third of a DP budget and is labor intensive as well as the most error-prone method of data gathering. The more people who handle the data, the more errors the data will contain when it reaches its final destination.

Even IBM seems to be recognizing the increasing need for distributed processing and remote source data entry with its recent announcement of communications terminals which have some intelligence.

Limiting this discussion to general-purpose terminals which can be used for a

(Continued on Page S/21)

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. . . Advent of Networks One of Most Recent Influences

(Continued from Page S/20)

broad range of applications and not to special-purpose terminals such as bank teller terminals or factory data collection terminals, two major groups evolve: interactive keyboard terminals and batch terminals.

While the category of batch terminals can be further subdivided into small, medium and large batch terminals, this article will deal with the two basic categories of interactive and batch terminals.

Interactive terminals are those terminals which consist of a keyboard input device and a printer, CRT or audio-response unit as an output device.

The simplest interactive terminal consisting of a keyboard and audio response unit would be a Touch Tone telephone.

As requirements increase, one enters the area of the teleprinter terminal.

In the area of batch terminals, which are basically interactive terminals with the addition of some form of bulk storage, there are as many choices available as in the interactive terminal area. Low-cost units such as the Western Union EDT 300 ASR (paper tape) or EDT 1200 MSR (magnetic cassette tape) are ideal examples of converting interactive terminals into batch terminals with the addition of a storage media. They are capable of performing as either interactive or batch terminals.

Although interactive terminals will perform most jobs, one of the prime rules in the development of any communication system is cost-effectiveness.

There are many situations where the information gathered has a life expectancy of days. In these cases, the batch terminal would be more cost-effective by far.

Although batch terminals are more expensive than interactive terminals, the real savings occur in communication line utilization. In a communications system, the line costs may vary from a third to a half the cost of the total system.

It should be clear terminals may vary greatly in structure, types and capabilities. Communication lines may also vary in types and tariffs.

On top of all these internal variations, there are a number of external forces affecting terminals and their capabilities.

Many, if not all, of these external forces which affected terminals so directly in the last 10 years have also affected the concept of distributed processing. Distributed processing and computer networks are not new concepts in anything other than cost-effectiveness and efficiency.

With the advances made in today's technology and in the DP and data communications industry as a whole, the concepts of distributed processing are becoming more realistic.

Computers are available in a variety of shapes and sizes capable of fitting the needs of any company or any part of that company. While trained people are still a problem in many areas, there is no question the number of people within the industry has grown greatly in the last 10

Intelligent Terminals

Growing along with the renewed interest in distributed processing has been the new field of intelligent terminals.

Since the control unit of an intelligent terminal is a minicomputer or microprocessor, there are times when it is extremely difficult to distinguish between an intelligent terminal and a remote processor.

The final decision as to what it is must be determined by the amount of time spent at each function. If the device spends most of its time moving data and very little processing that data, it must be considered a terminal. If the device manipulates the data and only transmits specific information to the central computer site, it must be considered a remote processor.

There is a close relationship between the intelligent terminal and the remote processor, and both are necessary within the area of information systems.

In some cases, the intelligent terminal can perform the functions of the remote processor, but, in all cases, the remote processor can perform the functions of the intelligent terminal.

A good system for those communication users with, or a desire for, remote processing is the "satellite" system configuration. This system divides the organization into a central processor area and a number of satellite processors. These satellite processors are in turn surrounded by satellite terminals.

Because the terminals are connected to an extremely intelligent satellite processor, they may be the simplest, most cost-effective type of interactive or batch terminal, and still supply the communication user with all the advantages of a network of intelligent terminals.

Spater is with Western Union Data Services, Mahwah, N.J.

Terminals Foreseen As Multifunctional

(Continued from Page S/11)

solution market will be hotly contested as the minicomputer mainframe manufacturer is being threatened by the rapidly escalating capabilities of microcomputers, and terminal suppliers can now add processing power at lower cost.

The microprocessor will add flexibility to terminals.

One common complaint among users has concerned the necessity to adjust their operations to fit standard terminal functions.

Optional functions can now be provided by an LSI chip or circuit board or by a microprocessor with a read-only memory specially programmed for the function.

Economy will often dictate that several functions be combined in one of these types of hardware, but the variety of mix-and-match combinations will be much greater.

One final requirement often underestimated is that these multifunction terminals need extensive networking capability. This is a must in order to provide the necessary direct access to multiple central processing complexes and to networkwide data bases.

Furthermore, this networking capability will be required for the execution of either single host or network jobs involving multiple hosts.

McNabb is corporate vice-president and Reis is director of business planning in the Teleprocessing Systems and Services Group at Sanders Associates, Inc., Nashua, N.H.

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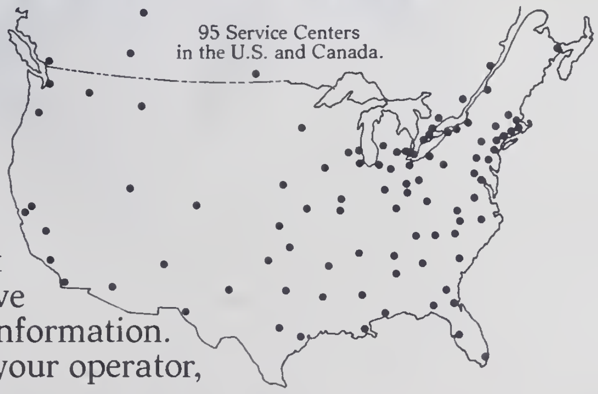
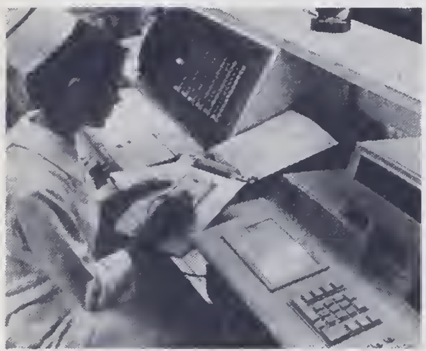


'Medics' Can Boost Hospital Accounting Revenues 7%

ST. LOUIS – Compared with manual hospital systems, the Medical Information and Communications System (Medics) can boost accounting revenues an average of 7% – generally enough to pay for all the hardware, software and salaries required for the system.


A nurse transmits orders by running a wand over the tags on the patient's chart.

The system, which handles all patient-related information from preadmittance through discharge, is built around two CPUs such as NCR Century 101s.

One is for the on-line operation. The other is primarily for batch processing, but it also provides the technical backup so desirable with an on-line system.

Linked to the system are terminals in all the need-to-know departments: admitting, nursing units, pharmacy, laboratory, radiology, central supply, transportation, dietary, housekeeping, patient information, chaplain, doctors' lounge, etc. – wherever the hospital chooses.

Updates Other Systems

Medics also "feeds" and updates the rest of the hospital systems, which are furnished without charge by NCR as part of its hospital package. Included are inpatient accounting, post-discharge accounts receivable, accounts payable, payroll, personnel, inventory accounting, general ledger, medical audit and statistics.

Most typically, admitting has a video display terminal with a small, nearby printer. Most other departments have printers, usually NCR 260s, which are compact, quiet units.

However, each of the nursing stations utilizes an NCR 275 hospital terminal incorporating a hand-held light pen, or "wand" scanning device which reads service orders or other data from color-coded bar tags on patient charts, a catalog of hospital services, etc.

Wand reading is much faster and more accurate than keying in data, for example. While the technology is new to the medical field, its simplicity has been proved in retailing where accurate entry of multiple transactions is also a necessity.

"Paramedical personnel are not interested in the technological niceties of an on-line system," declared Homer H. Schmitz, executive director of management services at the 505-bed Deaconess Hospital in St. Louis where Medics is on order to update an older on-line system with 37 terminals.

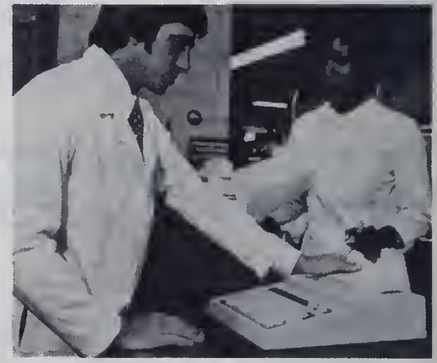
"Thus, the terminal concept of Medics is excellent because the NCR 275 is simple to use quickly and accurately. When our personnel need something for a patient, they want it right now. Also, the system will provide an automated nursing prep printout at the 275 which will be particularly valuable.

"Moreover, at the time we performed our analysis, Medics was the most cost-justified system that would meet our present and future requirements," continued Schmitz.

"Our terminal network was originally linked to a Century 200, replaced in March by a dual Century 201.

Total Regime of Treatment

"In short, Medics will enable the computer to encompass the total regime of treament," Schmitz said, "and integrating the delivery system into the total health care team will insure the lab, X-ray and pharmacy, for example, will know much more about the patient than presently is possible. Patient care and well-being are bound to benefit."


Departments are notified of a patient's admittance and receive orders via printers such as this NCR 260.

Because the Medics system will at first essentially replicate the present on-line system at Deaconess, Schmitz estimated training time per employee will average no more than 45 minutes: the procedures will be basically the same, only the terminals will be new.

When Deaconess swithced from a manual system to its present on-line system, nonroom revenue rose $3.79 per patient day. Deleting all possible charges, changes and other factors that could hypothetically have contributed to the increase still left a gain of $2.27 per patient day that could be accounted for in no other way than by the recovery of previously lost charges.

This exceeds the total cost of the old system or even the expected cost of the more flexible Medics system. NCR's figures for a 400-bed hospital – 105 beds less than Deaconess – are an average cost of $2.25 per patient day, and the more beds, the lower the per patient day cost, of course.

Typical Situation

In a typical hospital situation with Medics, preadmitting data is gathered by telephone and entered into the system via video terminals or one of the Model 260 terminals. Then, at admitting, the data previously entered is displayed on the video terminal, verified, and the computer then transmits the patient information to the departments.

When a doctor enters the hospital, he signs in at any terminal to receive messages left for him – again at any terminal – plus a list of his patients and the number of days they have been in the hospital, etc. The doctor makes his rounds, signs out at any terminal and, again, gets any messages. He can also get

(Continued on Page S/24)

The Q Terminal

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'Medics' Boosts Revenues to 7%

(Continued from Page S/22)

another list of patients if he wishes.

Meanwhile, the services the doctor has ordered are entered into the system via the 275 and the wand reader: the clerk simply runs the wand over the patient's chart to pick up the patient number from the color-bar coded label attached to it.

Then he passes the wand over the tags of the services ordered, which are listed in the catalog of the hospital's services. Any special instructions are also transmitted by passing the wand over their bar codes, and finally the unit clerk runs the wand over his badge. The 275 terminal edits these entries and flags any entered in the wrong sequence. Then the terminal prints out the data the clerk has entered so he can scan it. If he sees an error, he reverses it with the wand and reenters the instructions.

Messages designated as relatively urgent are sent "stat," or priority status. They still won't interrupt a transmission in process at the receiving end.

Reports Printed

Reports printed as a by-product of the batch run include:

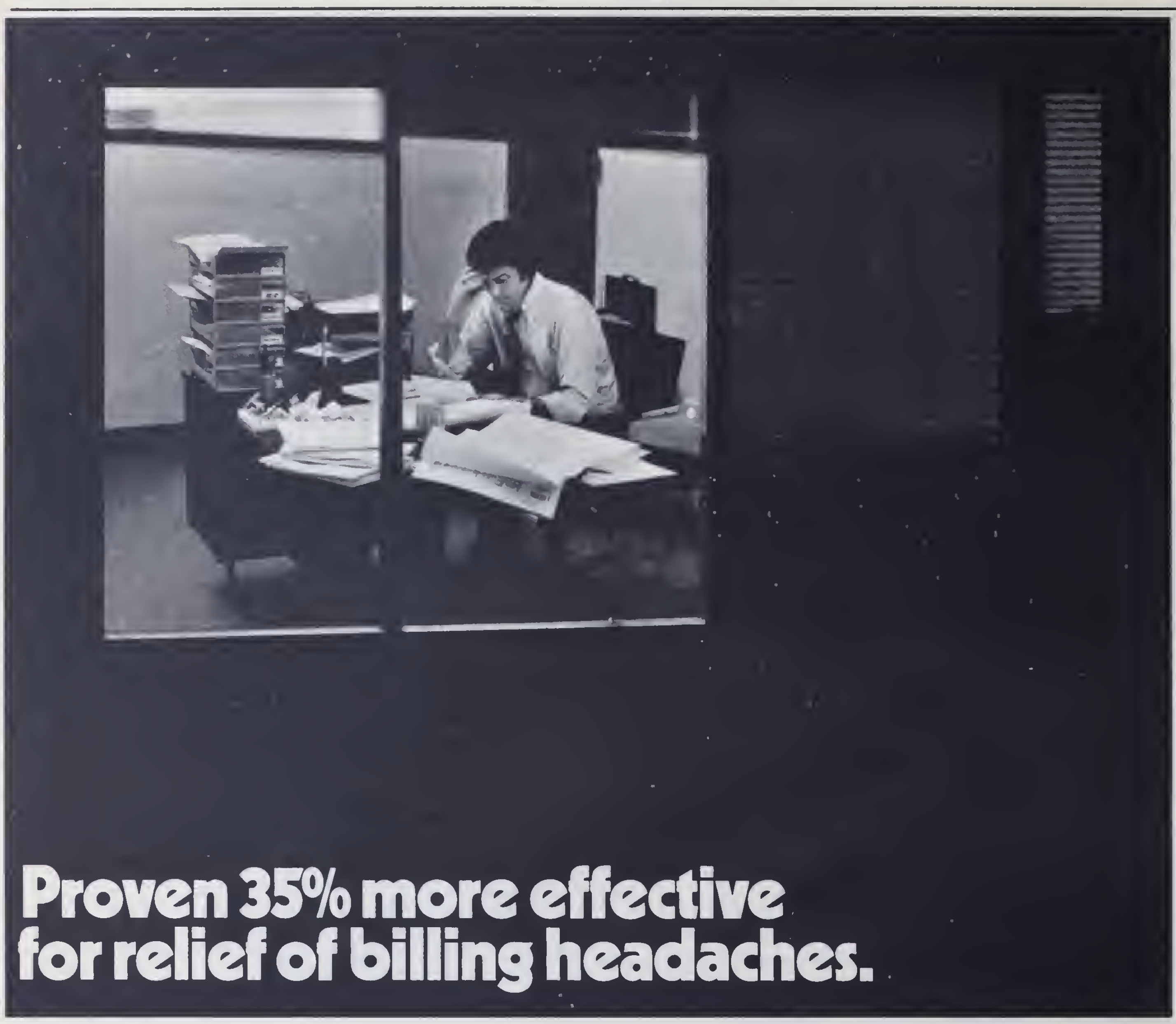
- A listing of unreceived messages by department – but the messages will still be on-line when the system comes back up.
- A listing of physicians' messages unreceived.
- A suspense file which lists items not to be placed on the patient's accounting record immediately – items which must be verified first or externally priced, such as surgery.

If a patient is moved to another room or department, the unit clerk again uses the wand and bar-coded catalog of services plus the stored patient census.

The charge for Medics software (including the complete service order catalog) and implementation is $60,000 which can be spread over five years.

This includes the work of an NCR four-man corporate support team which will frequently be on-site during the nine- to 12-month implementation period, a full-time, on-site systems analyst and a regional specialist.

These personnel define what the hospital will do and what NCR will do, with help from the hospital's Medics coordinating committee and its Medics coordinator and assist in guidance, training, indoctrination and the like. Hardware cost is additional.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*Charles E. Lamb, Senior Vice President, Valley View Computing Systems (a subsidiary of Valley View Investment Co., Inc.), Overland Park, Kansas.

"We checked them all...only the Entrex data entry and pre-processing system has the power we need to capture daily billing, bookkeeping and insurance data for 150 physicians and enter daily transactions for five banks...plus the source data collection we need to provide clinics with 24-hour turnaround," says Charles Lamb.

"There's nothing like it for getting cleaner data into the mainframe fast. We've reduced our error rate from 100 errors per batch to two – saving countless pages of edit runs on the computer, and cutting mainframe edit time by 66%.

"Best of all, the Entrex system was installed, accepted by my operators, and running in less than a week. Since then our total productivity is up 35% over punched cards."

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System Ends Pump Manufacturer's Inventory Problems

By Charles L. Gruber
And Michael J. Obershaw
Special to Computerworld

DELAVAN, Wis. – Not long ago, Sta-Rite Industries had a sizable problem in keeping track of the many components for its pump manufacturing business.

Product enhancements meant more component changes. The company had to match material availabilities and production activities to a constantly shifting pattern of end-product demand.

And it had to have just the right parts at the right time in the correct quantities to satisfy each customer's special order requirements.

Integrated computer systems that blend direct order entry, bill-of-material maintenance and shop floor control reporting have reduced the problem to manageable proportions.

As a result, customer service levels are higher, order turnaround times are shorter, production is more efficient, component inventory is available and manufacturing costs are lower.

These three key computer-managed functions share a common data base which is continually updated by an IBM 370/135 at the corporate data center.

The real-time control system is triggered by customer orders. These orders enter the system directly via IBM 3270 CRTs located at the manufacturing plants and linked by phone line to the corporate computer.

The order entry system, which has been on-line since late 1973, processes hundreds of customer orders every day. The average order, with seven line items, has an average terminal response time of seven seconds.

The interaction between the computer and the 3270 operator helps assure the accuracy of order data and supports versatility in processing each order to the customer's specifications.

Creates Two Records

After computer editing, the order data creates records on the order master file – both a summary record and a detail record. The entry transaction also updates a customer master file record and activates other key elements of the common manufacturing data base.

Order requirements are posted to the parts master file to update an on-order record. The parts master stores continuously updated availability and requirements status information about each of 60,000 parts used in production.

The new information is quickly available for 3270 inquiry, and manufacturing management has ready access to up-to-the-minute information concerning the situation for any line item.

Shop Floor System

Information captured in the data base as a result of the on-line order entry routine is also used for input to the shop floor control system. Working with the end-item requirements, manufacturing develops a daily production schedule and processes item numbers, quantities and dates required against the shop floor control programming.

The system then calculates the daily manufacturing schedule. Working with a bill-of-material master file which is linked to the parts master, the system calculates component availability through every level of the end-item bill.

If all needed parts are available in the required quantities, the system produces a planned production order. If needed parts are not available, a shortage list is generated for expedite purposes.

The shop floor control system allocates available inventory at all bill-of-material levels, based on IBM's Data Base Organization and Maintenance Processor (DBOMP) which links together all of the individual master files comprising the data base for information update and retrieval.

The system also computes lead times, run times and move times for each operation required to machine and assemble the needed parts.

Job packets are generated by the shop floor control system – one for each shop order, containing computer cards for related stock withdrawals, labor reporting cards and finished item receipts. The job packet cards permit the computer to track work-in-process status and inventory through each operation.

Information produced by the shop floor control system updates the data base files to reflect inventory availabilities, item requirements and the overall manufacturing situation at all times. It also provides daily order status, work-in-process summaries and item and work center priority lists.

The on-line order entry and shop floor control systems are directly interdependent. The shop system draws its essential scheduling data from the order system and exchanges work-in-process and inventory information to update open order and total item requirements, as well as inventory availability records.

Bill-of-Material System

Another computer-based system also contributes importantly to manufacturing balance and efficiency. This is the on-line bill-

(Continued on Page S/27)

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96
72
48
24

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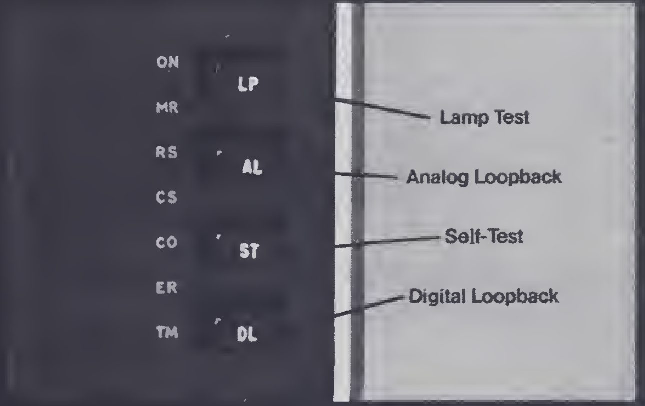

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Additionally, *Silent 700* ASR terminals can reduce your system expansion costs. Their modular design allows you to enhance terminal performance as system requirements grow.

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Ill. Bank Finds Simple Display Key to Success

(Continued from Page S/3)

time and money when it came to checking data.

"The cashier of the bank has estimated Comset saves his tellers 15 seconds to 20 seconds per inquiry," Zimmerman said. "Part of the saving is the teller gets the needed information the first time without having to make a second inquiry. It just takes a momentary break in concentration with audio response and you've missed something."

Other Factors Examined

The bank was also interested in examining other factors during the trial period, according to Zimmerman.

"We were interested in finding a device that would fit within minimal cost areas," he said. "We analyzed three devices: full-size CRTs, audio response and Comset.

"Full-size CRTs were immediately ruled out because of cost. Audio response was in the same price range as Comset, but prone to user errors. So the logical decision was Comset which, in addition to lower price, provided the reliability of a visual display."

"We were also interested in finding a device that could be installed and maintained with a good, well-trained installation and maintenance group. Of course, the telephone company has this capability throughout the country."

Illinois Bell installation personnel were able to make each terminal operational in about 10 minutes, so bank personnel had working units immediately. "I think that's very significant to the user," Zimmerman said. "There's nothing worse than giving a user a piece of equipment he can't use until the bugs are removed."

"Personnel training was very simple too. In fact, it took less time to train each person who was to use the Comset than it took to install each unit."

Zimmerman believes Harris Bank can eventually use 200 to 250 Comsets in various functions at the bank.

"I see the system basically used to inquire into a data base," Zimmerman summed up. "It will be used for specific information requests. There is no reason Comset can't have a very important role in access to the data base of any bank."

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Turnkey Net Proves Beneficial

WAUSAU, Wis. – Employers of Wausau, a group of casualty, property and life insurance companies headquartered here, recently replaced its paper-tape data communications system with a network of 35 buffered, remote-batch terminals from Wiltek, Inc. of Norwalk, Conn. All data traffic is controlled by Wilcom, Wiltek's in-house message-switching service.

Pat Monahan, telecommunications manager at Wausau, singled out Wilcom's message-switching service as the key to economy, efficiency and improved service gained by Employers of Wausau since the system was installed.

"We were able to sign an order for the Wiltek system and have a working network six weeks later," Monahan said. "The first day we had a reject rate of 10%. The second day, rejects were practically zero. Not many systems achieve that kind of start-up."

Dial-Up Network

The system for the insurance company consists of a configuration of three Model 500 CRT terminals and two Model 400 (30 char./sec) receive-only terminals installed at the firm's headquarters, plus Model 300 (10 char./sec) terminals installed at each of 30 regional offices. The Wiltek terminals transmit data at 1,200 bit/sec over dial-up Wats lines using binary synchronous protocol.

The Model 400 terminals installed at the headquarters are 30 char./sec printers used to receive the higher volume of traffic coming into the central office.

Data transmission is via the Model 500 CRTs. The slower Model 300 terminals are used at regional offices to communicate with headquarters, and there is also a small amount of region-to-region traffic.

At company headquarters, messages are dictated over an intercom network into three recorders. Operators using headsets take the dictation and type the data directly onto the CRT screen of the Wiltek Model 500 terminal, where it can be edited if necessary.

The data is then transmitted to the terminal's send buffer for temporary storage until the terminal is polled by the central Wilcom DEC PDP-11, located at Wiltek's headquarters.

Prior to installing the system, Employers of Wausau used a Model 33 Teletype system. The average time for the preparation and subsequent transmitting of messages using the old 10 char./sec, private-line network was approximately one hour. Now that operators are using Wiltek terminals that are polled under Wilcom, the average message is being typed and entered into the terminal's buffer five minutes after being written, with the message going out on the next polling cycle – well under the previous time of one hour.

Operators at Employers Insurance of Wausau use headsets to take dictation previously recorded over the company's intercom network. This data is then typed directly onto the CRT screens of three Wiltek Model 500 terminals. The CRT terminals are polled by Wilcom, the message switching system.

According to Monahan, the elimination of paper tape has meant a great deal to the operators at Employers of Wausau. "A person who can type can be trained to use the Wiltek equipment in 10 minutes," said Monahan.

Benefits of a Turnkey System

Monahan pointed out that the benefits of the Wiltek terminals – ease of operation, high speed, data reliabilitv and less noise – complement the centralized control provided.

"The overall system approach with Wilcom is easier," said Monahan. "Now I have one vendor who installs, monitors and services the equipment. Actually, the network manager is Wiltek. This leaves me time for systems planning."

With current traffic volume at 1,200 messages per day, the system is cost effective, and the network will be able to support a 100% growth in message volume with only a 10% increase in system costs, he said.

Messages transmitted over the network are basically administrative data – claims, legal contracts and underwriting. Wilcom not only switches this traffic, it compiles statistical reports that help Monahan gauge overall system performance.

For example, he gets a monthly summary of message and character volume plus a quarterly report on service. The net also provides redundancy, offering total backup for the message-switching service.

In addition, the net has the ability to interface directly with Employers of Wausau's computer installation.

"Our operators have indicated they have a great deal more time to work on other stenographic functions, yet the volume of messages sent by each office has not declined.

"In effect, we have gained approximately one-half day additional utilization from each of our operators in our 30 service offices. In the home office, we have been able to reduce our staff to 2-1/2 operators, while we required four with the old system," he said.

Inventory Problems Ended

(Continued on Page S/25)

of-material system. Using the visual display computer terminals, the system allows engineering departments at the operating divisions to instantly access the parts master and bill-of-material master files and quickly make a part or bill addition or change.

Together, the three systems – order entry, shop floor control, and bill-of-material maintenance – combine to help achieve substantial benefits for the company, the operating divisions and our customers.

Real-time order entry, for example, sharply reduces the turnaround time for the average customer order. It also helps eliminate delays in responding to a customer inquiry as to the status of an order or an individual order item.

Division personnel are relieved of a paperwork burden because the on-line entry system automatically transmits back to the originating division the shipper releases and lading documents.

The shop floor control system lifts a tremendous paper load off manufacturing management and plant personnel. It saves hours and dollars in manufacturing operations by providing the timely inventory, work-in-process and requirements status information plant managers need to effectively plan materials acquisition and schedule and control production.

The on-line bill-of-materials system permits fast posting of parts specifications and changes in the manufacturing data base.

Gruber is corporate director of data processing and Obershaw is DP manager at Sta-Rite Industries, Inc.

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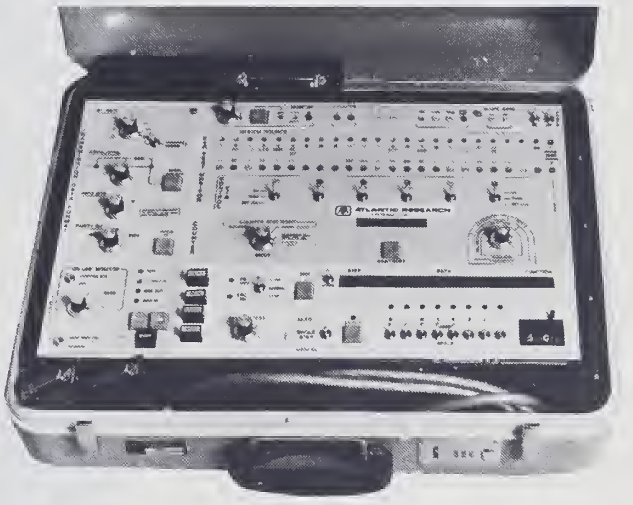

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A display that people like. Precise. Crisp, with 9 x 15 dot character cell. All sorts of options, such as inverse video, underlining, half bright, blinking.

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Time-Sharing Uses Emphasized For DEC Datasystem 350 Series

MAYNARD, Mass. – Three commercial systems from Digital Equipment Corp., called the Datasystem 350 series, are said to feature true time-sharing.

Datasystems 352, 354 and 356 comprise the series. Prices range from approximately $20,000 to $70,000 depending on the mass storage selected. Deliveries are scheduled for August.

A small- to medium-sized company can use any 350 model as a stand-alone computer system, the firm said. Larger companies can use the 350 as a dedicated system or in a distributed or decentralized facility.

Additionally, the Datasystem 356 can function as the central computer in a small- to medium-size distributed processing network, DEC said.

Each system, whether stand-alone or in a network, can support up to four hard-copy or CRT terminals, each performing and utilizing the same data base. Datasystems 352 and 354 are fully upward-compatible with Datasystem 356, the firm added.

All 350 series computers employ a PDP-11/10 CPU with 32K characters of core, which can be expanded to 56K characters. Mass storage for the series includes a minimum of two floppy disk drives providing 512,000 characters of on-line storage for the 352; two cartridge disk drives providing 4.8M characters for the 354; and two pack drives providing 40M characters for the 356.

Maximum on-line storage is in excess of 160M characters. The 352 and 354 can be upgraded in the field to the next highest system.

Dibol Under COS

The series operates under the Commercial Operating System (COS) 350, which provides time-sharing with a high-speed response. The system features detached jobs, intertask communications and line printer spooling. Additional features include more than 200 text error messages, a sort utility, a selective data file and total disk backup utilities. Running under COS 350 is Dibol-11.

An optional IBM 2780 communications protocol package is also available. Operating under COS 350, this option emulates the 2780 for telephone transmission of data in a distributed network.

A typical configuration for the 352 consists of the CPU, two floppy disks, a video terminal and a 30 char./sec printer. It will sell for approximately $20,000.

The 354, with two cartridge disk drives, CPU, two terminals and a 165 char./sec printer, would be in the $37,000 range and a 356, with two disk packs, CPU, any combination of four video or hard-copy terminals and a 300 line/min printer, would be between $65,000 and $70,000.

Additional hardware options include a choice of several video or hard-copy terminals in any desired combination up to four per system and any one of four printers ranging in speed from 30 char./sec up to 300 line/min. Also available are a choice of 800 or 1,600 bit/in. tape drives and an 80-column card reader.

Datasystem 356

Turnkey Payroll Package Includes Mini, Software

ELMSFORD, N.Y. – A modular payroll system has been developed to protect users against the potentially serious impact of changes in taxes at different governmental levels.

The system introduced by Mini-Computer Systems, Inc., uses the Micos operating system and is said to assure users of easy payroll maintenance regardless of the scope of changes in taxes and other factors requiring payroll deductions and regardless of the governmental jurisdiction.

Constructed in modules, the system enables users to plug in, plug out simply and rapidly without special programming effort, the firm said.

Any combination of federal, state, county or municipal taxes, union checkoffs or other elements can be selected, altered or eliminated at any time.

Changes can be made by nontechnical personnel within the user's organization or by the vendor in less than one day, it said.

Covers All Deductions

All deductions are covered, whether employer- or employee-oriented, including federal, state or other income taxes, Fica, unemployment insurance, workmen's compensation, hospitalization, union dues, savings plans, annuities, etc.

The system can process work periods of any length and in any combination, from daily through annual payments, thereby accommodating temporary personnel as well as those permanently on the payroll.

The payroll system can be supplied in various configurations for single or multiplant service. A basic $5,000 system consists of a CPU with 32K memory, three CRT terminals, a disk drive, a 120 line/min printer and the complete application software.

Optional features include a tape drive for storage or conversion or both, higher speed printers and additional terminals.

Also available is a solid-state swapping memory module that provides average access time of 2 μsec and a transfer rate of 2M byte/sec, supporting two to four times as many terminals with no decrease in individual terminal response time.

The firm is at 515 Executive Blvd., 10523.

System/7 User Finds

Mini Saves Time on Mainframe

By W.T. Stephens

Special to Computerworld

WEST MONROE, La. – Computer technology has made it possible for a paper mill to install a real-time mill production and reporting system – and do it at a cost the mill can justify.

At Olinkraft, Inc.'s Mill Division, for example, we have built an on-line system based on a small computer which connects to our mainframe daily, but eliminates much of the overhead on the mainframe normally associated with on-line systems.

We have licked the cost problem by dedicating to the on-line system an IBM System/7 only, which runs unattended and exchanges processed data with a larger business computer.

This combination of computers has enabled us to provide an around-the-clock management information system for a minimum investment in hardware and personnel.

Meanwhile, our medium-sized business computer, a 370/135, remains available for the type of work it does best – processing and storing large amounts of data.

Based on orders entered, the 135 prepares production schedules, machine schedules, roll and set cards, shipping schedules, etc. Daily, it communicates this information to the smaller computer, and/or modifies the data based on input received back from the System/7.

In this way, we have constructed a total mill information system using these two computers. The system covers activities from order-entry through billing, sales analysis and cost accounting.

The cost of the data collection and information system, including the smaller System/7, nine data entry units, three printers and two display terminals, has been more than offset by direct manpower savings.

Seven employees who were involved in weighing rolls and preparing shipping documents in the mill have been reassigned, mostly to other jobs which enhance shipping efficiency and customer service. The system also is responsible for additional labor savings in the accounting and billing departments.

Since the 135 supports all the Olinkraft industries, it would not be practical to dedicate it to a production information system.

Nor would we want to. The cost of dedicating equipment of this size to a continuous operation is one reason more paper mills haven't installed plant information systems.

However, the System/7 can store data covering as many as 30,000 rolls and 10,000 open orders. It has two disk drives for technical backup and automatic programming load and restart in the event of a brief power failure.

Data Entry Locations

In our approach, the data entry devices linked to the System/7 are located at key operating points in the plant.

At the rewinder for each paper machine, the computer automatically gathers footage information from a digital read-out beside the entry unit and adds the data to its stored roll and customer records.

The operator merely inserts a "set card" in the data entry unit to trigger the system. He then staples a roll card to the core, routes the roll to the scale and sends a tear sheet to quality control.

In the quality control section, personnel enter moisture and basis weight data or, if they find a flaw, enter data indicating the roll is being held. The System/7 won't allocate any production before the data is received from the quality control lab.

When a roll arrives at the scale, the operator pulls off the roll card and places it in the data entry unit as he weighs the roll. This assures the weight is applied to the correct roll.

The mini automatically records the scale weight, calculates what the roll should weigh based on footage and basis weight and compares the two.

If there is a discrepancy, the computer notifies the operator through an adjacent printer.

Typed out are the roll number, calculated weight and actual footage and the actual weight and calculated footage. This procedure catches a variety of errors.

If there is a problem, the roll may be culled or retained. If everything is in order, the scale operator staples the roll card to the core again and forwards the roll to shipping.

Incidentally, we have virtually no difficulty with torn, mutilated or damaged cards because the data entry units can read them in practically any condition.

In shipping, the 2790 data entry unit is located adjacent to a 3270 CRT terminal and two 3286 printers. The System/7 maintains a record of each railroad car by means of a two-digit number assigned to the car when it arrives.

To ship, the operator inserts a roll card in the data entry unit and allocates the roll to a car through the terminal.

He can also inquire through the terminal to determine which rolls are in or belong in what cars.

The system provides data such as the order number, tally,

(Continued on Page 20)

No Moving Parts in This Card Reader

OLD SAYBROOK, Conn. – A new concept in low-cost magnetic stripe card readers has been developed by Cramer Division of Conrac Corp.

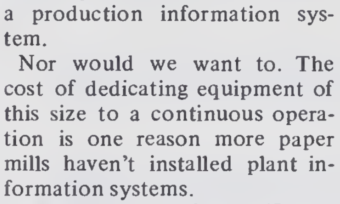
The hand-operated Conrac CR-1000 has no moving parts, springs, dampers or return mechanism. The card is stroked through the slot by hand. The unit is designed to operate at speeds of from 2- to 60 in./sec and is said to be insensitive to speed changes.

The reader comes with detection and code conversion electronics. The output is RZ serial data with a clock.

Reads ABA, IATA Standards

The CR-1000 is capable of reading cards encoded with two-frequency (Aiken) coherent phase recording which conforms to American Banking Association (ABA) or International Air Travel Association (IATA) standards.

The unit is priced at $95 from the firm at Mill Rock Road, 06475.



Conrac CR-1000

System/7 User Finds Mini Saves Time on Mainframe

(Continued from Page 19)

weight, number of first roll loaded and the last roll loaded, total number of rolls loaded and shipping time.

The operator can obtain a display of complete order status, by order number, as to the number of rolls, footage and the weight.

The display shows whether the rolls are ordered, scheduled, produced, weighed, culled, loaded, in inventory, shipped or held awaiting a quality control check. The operator can also get a "hot report," a summary display of an order and every roll in it, to use in car loading if necessary.

Natural Evolution

This emphasis on computer-activated displays is a natural evolution in data processing from the production of multiple reports.

Now, the operating people can obtain the information they need, when they need it, in the most concise possible form.

The only printed documents produced by the system now are the error messages at the scale and the shipping tallies. The operator can obtain a tally for a specific car just by keying-in the car number and a code and pushing the start button. This initiates a detailed order tally, with summary data at the bottom.

Daily, the System/7 transmits to the 135, in batch mode, all the transactions that have occurred over the past 24 hours. The 135 updates its master files on production performance, order backlog, inventory roll status, shipping and billing.

It produces detailed production performance data, by machine and grade, for an operations meeting in the mill. The 135 also produces daily reports on order status and backlogs, inventory by customer, shipping for the day, month-to-date and year-to-date, by customer and product. It generates daily billing and month-to-date billing and profitability by account and product.

For other mills considering installation of a production information system, we have a few suggestions:

- Give the best man available the responsibility for the job.
- User participation is absolutely vital. Get the people in the mill involved to the greatest possible degree.
- Train everyone thoroughly.

Stephens is director of financial planning at Olinkraft, Inc.

Business Competes With Grades On Norwegian College's Mini

STABECK, Norway – A mini installed here at NKI Correspondence College, Norway's largest private institute of learning, keeps track of students' progress, does general administration and also takes care of hands-on instruction in DP and computer-related topics.

Employing over 90 full-time and 1,200 part-time instructors and educational personnel, NKI offers courses including electronics, automotive technology, DP and environmental studies.

Founded in 1961, NKI now issues some 560,000 lessons a year, replies to 45,000 questions, corrects 15,000 tests and supervises 600 final examinations.

NKI made the decision to install a Data General Corp. 840 because its previous equipment was unable to supply the school's present and future computing needs. The installed configuration includes a 48K Nova 840, 512K fixed disk, floating head disk, two card readers, paper tape reader, line printer and visual display.

Handles Salary Programs

In addition to keeping track of the school's 11,000 students and follow-up replies to 5,000 correspondence course participants, the system handles wage and and salary programs.

This and other administrative work accounts for 60% to 70% of computer usage. The other 30% to 40% is used for instruction. Some 60 students are studying DP, and a total of 340 students are exposed to the computer for instructional purposes.

The installation is equipped with 12 terminals for instructional use, on which programming is carried out in Time-Sharing Basic. Batch processing work is programmed in Fortran, Basic and Assembler Language.

Remex Has 8-In. Hubs For Reader/Spooler

SANTA ANA, Calif. – The RRS6500 punched-tape reader/spooler from Remex is now available with 8-in. NAB hubs for minicomputer users.

For users currently employing separate NAB hub spooler units in combination with tape readers, the RRS6500 with 8-in. NAB hubs can represent a cost saving of up to 50%, the firm said.

The reader/spooler offers read speeds of 500 char./sec synchronous and 300 char./sec asynchronous, is bidirectional and has a rewind speed of 1,500 char./sec.

The reader features stepper motor/sprocket drive design.

The unit is priced at $1,900 from the firm at 1733 Alton St., 92705.

Recorder Weighs 12 Ounces

MIDDLETOWN, Conn. – A miniature digital magnetic recorder, the Model 6409 minicassette recorder, is available from Raymond Engineering Inc.

Measuring 3 in. square by 2-1/2 in. high and weighing 12 oz., the recorder was designed for applications requiring minimum size, weight, power and cost, the firm said.

The recorder uses the miniature cassettes introduced by Information Terminals, Inc. which hold 50 ft of usable storage on .015-in. wide tape.

Although small in configuration, the unit offers a data capacity of up to 500K bits, the firm said. It is priced at $150 in quantity, $300 for one from the firm at 217 Smith St., 06457.

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Three Phoenix Replaces TA-11

PHOENIX – Three Phoenix Co. has developed the TCP-1000 tape cartridge peripheral to replace the Digital Equipment Corp. TA-11 cassette tape system.

The TCP-1000 interfaces with the PDP-11 Unibus and is software-compatible with the TA-11. It uses the 3M DC300A tape cartridge as its storage media and the Three Phoenix TCD-300 tape cartridge drive.

Features of the TCP-1000 include up to 20.5M bytes of on-line storage; one to eight drives per controller; 6 kbyte/sec transfer rate; and 120 in./sec independent rewind.

Priced from $3,195 for the main controller with drive, the TCP-1000 is cabinet-compatible to the TA-11 magnetic tape cassette unit and occupies 5-1/4-in. of panel space for two drives.

The firm is at 10632 N. 21st Ave.. 85029.

Miniworld Products

Xecon Microcontroller Has Programmability

HAWTHORNE, Calif. – The XMC-360 programmable microcontroller from Xecon Associates is said to contain the most desirable features currently available in both stored program controllers and high-performance microprocessors.

On-board features include 8-bit binary or 4-bit BCD arithmetic; individual bit test and manipulation capability; 32-word by 8-bit general register file; 16 level Lifo stack for subroutine nesting; high-speed, low-overhead multilevel interrupt; parallel, serial and bit I/O; and 1K word on-board program memory (field-programmable read-only memory).

Program memory is expandable externally to 4K words.

The firm said typical register-to-register binary arithmetic, control and test operations are fully executed in 480 nsec. Literal orders, bit manipulation, jump and link instructions are fully executed in 360 nsec.

Multidigit BCD arithmetic is performed at a rate of 840 nsec per digit. Over 50 instructions are included in the standard repertoire.

System development aids include a program development/control console, high-speed paper tape reader and time-share cross-assembler.

The basic microcontroller sells for $825 from the firm, which can be reached through P.O. Box 267, 90250.

General Instruments Starts Memory Support Program

HAWTHORNE, Calif. – General Instrument Corp.'s Rotating Memory Products Division has set up a program designed to service and support users of General Instrument and Bryant rotating disk and drum memories.

The program includes overhaul facilities in the U.S. and Europe and strategically located spares depots.

The company has internal facilities to replace the magnetic recording medium on their drums and disks and to manufacture their own heads. Complete documentation is maintained so the company can manufacture parts no longer in production, it said.

The firm is at 13040 S. Cerise Ave., 90250.

Plotter Controller Uses Micro

AUSTIN, Texas – The two biggest problems in time-share plotting – transmission errors and high operating costs – are said to be directly handled by Houston Instrument's PTC-5 plotter controller.

The PTC-5 utilizes a microprocessor to automatically detect and correct transmission errors and increase the efficiency of the host computer software with no changes in the operating system software.

In addition, the microprocessor provides for local generation of alphanumerics, a blocked format circular buffer, compressed plot codes, compatibility with a wide range of data transmission rates and an implemented two-way handshake procedure with the Fortran-level plotting software, the firm said.

The PTC-5 may be used to operate plotters remotely from a host computer such as in time-sharing. It may also be used locally as an interface to computers having communication capabilities.

The PTC-5 accepts data from either an EIA RS-232C type of data source or a Teletype 20 mA loop current data source such as a modem or acoustical coupler.

The PTC-5 may be used with a remote teleprinter. In this case it will monitor the incoming data and automatically determine whether the data is plot code or data for the teleprinter.

In order to reduce both data transmission time and CPU overhead, the PTC-5 firmware contains algorithms for line-segment and character generation. In most cases, the CPU time required to produce plotter output commands is reduced 50% or more compared with previously available systems.

The PTC-5 sells for $1,945 from the firm at One Houston Square, 78753.

MDB Systems Module Links PDP-11 Unibus, User's Peripheral

ORANGE, Calif. – MDB Systems, Inc. has introduced a $250 general-purpose interface module said to provide a flexible and economical basic interface between a Digital Equipment PDP-11 Unibus and a user's peripheral.

Designed mainly for users with access to an electrical engineer, the MDB-1710 interface consists of mounted integrated circuits plus wire-tap facilities for up to 40 IC devices on a single quad board. Essential and universal Unibus logic interface elements are premounted and interconnected, with wire-wrap facilities for address selections and interrupt vectoring available.

Wire-wrap posts also make it easy to connect Unibus driver inputs and receiver outputs for multiple controller applications, the firm said.

MDB Systems will design the complete interface for users in lots as low as 10 pieces. The firm is at 981 N. Main St., 92667.

Qume Character Printers Run at 40-, 50 Char./Sec

HAYWARD, Calif. – A family of high-speed character printers from Qume includes two models: Sprint 55 and Sprint 40.

Both machines, which are said to produce "letter-perfect final copy" at speeds of 55- and 40 char./sec respectively, use Qume's daisy print-wheel.

Both printers also offer a low-cost option which increases carbon ribbon life up to 33%, the firm said. The printer option is compatible with all existing Qume multistrike carbon ribbon cartridges.

The daisy printwheel is positioned by two servo motors for sharp letter registration. On the taller print hammer, impact is automatically adjusted to the correct choice of six intensities to match the size of the character being printed for even type impression.

The Sprint series prints on any type of form up to 15-in. wide. Quad-directional flexibility allows the daisy printwheel to move in four directions – up, down, left and right – to any preselected position.

The Model 40 with cover and power supply is priced at $2,695; the Model 55 is $2,950 from the firm at 2323 Industrial Parkway West, 94545.

Decitek Rerates Model 260

WORCESTER, Mass. – Decitek has rerated to 300 char./sec the read speed capability of its 260 SAM low-cost tape reader.

Without any adjustments, SAM will handle all standard 6-, 7- or 8-level tapes, center or advanced feed hole, of paper, paper-polyester or metallized-polyester, the firm said.

A single light source, fiber-optic distributor and a nine-element phototransistor sensing system perform the reading.

The firm is at 250 Chandler St., 01602.

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An open letter to the users of more than 2,000 Xerox computers worldwide.

As a Xerox computer user ourselves and as the prime second source supplier to other Xerox users, Telefile was as shocked as you were over Xerox' announced withdrawal from the stand-alone computer business.

Fortunately, however, we're in the unique position of having prepared for greatly expanding our scope of supply. We are prepared to fill the void and provide not only disk systems and peripherals, but to supply *total computer systems* including hardware manufacturing, software support and maintenance.

We urge you not to panic or defect. Give us the opportunity to meet all of your computer needs. We understand your massive investment in software that has committed you to the Xerox product line – one that in spite of the announcement is still second to none. That software investment in some cases is almost priceless. Clear and logical thinking must prevail and we firmly believe that Telefile can help to pull you through this current predicament. Telefile has already made a total commitment to the Xerox marketplace. It now has more meaning than ever before.

In terms of hardware . . . we have been formally announcing a new product each month that is hardware compatible and software transparent to Xerox computers. Disk systems, main memory, card readers, printers, communications systems, and device subcontrollers have already been announced.

Shortly we will have available communications controllers, MIDP's, 200MB disks, dual density tapes, 6250 BPI tapes, memory map for the Sigma 5 (so it can run CP-V), KSR consoles, card punches, electrostatic printers, solid state RAD's, and plotters, etc.

Software . . . we have steadily increased our software capability, however, it is somewhat limited now to software support rather than new developments.

Maintenance . . . to demonstrate our commitment to maintenance of Xerox computer systems, we have just opened up a new repair parts depot at O'Hare Airport in Chicago. In addition, we currently have full maintenance capability in New York City, Rochester, Memphis, Atlanta, Washington, D.C., Dallas, and Los Angeles. Scheduled soon are more sites in Philadelphia, Detroit, Sunnyvale, St. Louis, Indianapolis, New Orleans, Boston, Richmond, and Green Bay as well as Houston, Columbus, Tulsa, and Birmingham.

We have already purchased several slightly used Xerox computer systems to enhance our spare parts capability.

In addition, we have entered into preliminary discussions with Xerox regarding manufacturing rights on the Sigma 5, 6, and 7 and we expect to expand this discussion to include other mainframes as well as software documentation and spares.

Resulting from the Xerox announcement, we see a slight increase in delivery schedules due to an increasing order rate and an adjustment to short term lease rates because of higher risk factors. But historically, with each commitment, Telefile's on time delivery has improved. We are known as a company that delivers on its promises and our main commitment now is to provide you with what you need to make your current computer investment pay off.

We suggest you place your order soon for fastest delivery position. Our prices for peripherals and mainframes are complete, standard and guaranteed to remain firm until at least Novemember 1, 1975.

Clearly, Xerox is committed to honor presently accepted orders as well as existing lease, purchase and service agreements. Together with our own commitment and with Xerox' cooperation, we will strive to make an otherwise unfortunate situation into an acceptable one.

For direct discussions, please contact me at our California headquarters. Call toll free (800) 854-3128, or in California call (714) 557-6660. Or write Telefile Computer Products, Inc., 17131 Daimler St., Irvine, California. 92705.

Sincerely,

SV Edena

S.V. Edena
President
Telefile Computer Products, Inc.

Telefile

We're in this together.

COMPUTER INDUSTRY

CI Notes

Senate OKs Multiyear Bill

WASHINGTON, D.C. – The Senate has once again passed a bill permitting the government to enter into multiyear leases for DP equipment, a move that annually could save taxpayers an estimated $35 to $100 million.

The bill authorizes the General Services Administration (GSA) to sign multiyear leasing agreements, which will enable the government to take advantage of reduced prices offered under long-term leases.

The same bill passed the Senate last December but never made it through the House. Known as S. 1260, it is expected to be taken up by the House Government Operations Committee soon.

Under present law, agencies can commit funds for only one year at a time – the most costly way to contract for equipment – or else lay aside the total amount of funds obligated at the time the contract is signed, thus tying up huge sums of money in anticipation of future contract payment.

The bill authorizes GSA to enter multiyear agreements that exceed the funds in its rotating Automated Data Processing (ADP) fund, but limits the amount of unfunded contracts in a given fiscal year to the amount specified in that year's appropriation from Congress.

Burroughs to Buy Redactron

DETROIT – Burroughs Corp. has agreed in principle to acquire Redactron Corp., maker of word-processing systems with communications capabilities, cassette drives and other components.

The agreement calls for an exchange of stock which, under current prices, would be around $9 million.

The transaction is subject to a review of Redactron's operations by Burroughs, the execution of a definitive agreement between the two companies and approval by their boards and Redactron's shareholders.

Supershorts

California Computer Products, Inc. has established a direct sales and service organization in Canada based in Toronto.

– – –

National CSS, Inc. has opened a Paris office, its second in Europe, through CSS France S.A., a joint venture with Beyrard-Rivaud.

– – –

Rockwell International Corp.'s Autonetics Group has formed the Special Devices Department, which plans to provide bubble domain chips for prototype systems this year. The unit is also working on charge-coupled devices.

Makes Discount a Benchmark

GSA Services Bidding Plan Draws Fire

By Nancy French
Of the CW Staff

WASHINGTON, D.C. – The General Services Administration (GSA) is planning to give time-sharing and remote batch processing companies a shot at the estimated $200 million worth of government business previously contracted to Computer Science Corp.'s Infonet Division.

However, rather than evaluating proposals and awarding the business to the lowest bidder, GSA is developing a list of approved suppliers based on the highest discount offered the government rather than the lower cost.

Under the terms of a draft proposal now being circulated among industry members for comment, potential suppliers will be asked to submit their standard commercial price list plus the largest percent discount they are willing to offer the government.

Despite all the emphasis on a "discount benchmark," price will not be the only criteria for making the award, Theodore Puckorius, GSA's commissioner for automated data and telecommunications services, told *Computerworld*.

But industry members are not satisfied with his assurances. The scheme amounts to "an auction," according to Ed Leeson, executive director for the National Council of Technical Services Industries.

The council is an organization that represents 16 companies including Control Data Corp., Planning Research Corp., Lockheed, Systems Development Corp. and Computer Sciences Corp.

Leeson said his members object to an approach in which a big discount is going to be given by a company that wants to "give something away," and called the scheme unfair to the other bidders.

After all the evaluation is completed, "all you get is a rating which says you are qualified to do this work for the Federal Government," he said.

"We can't fault the government for trying to save as much money as possible but, in this case, we don't think the mechanics involved are being adequately handled, and we have submitted a white paper on the matter to GSA," he said.

Hurts Less Expensive Firms

Another industry critic pointed out that the scheme is unfair because it actually hurts the companies that give their commercial customers the best price breaks.

For example, a company whose commercial rate might be $100, with an 11% discount for the government, might be selected over another company whose commercial rate might be $94 with an 8% discount, even though the latter company's actual price to the government is lower.

Still another complained that the scheme assumes all companies' services are basically the same when, in fact, they are quite different.

"Companies in the industry cater to different markets and offer different products – they are selling the uniqueness of their services, not the similarities," he pointed out.

Not a New Idea

Puckorius, who inherited the bidding plan from his predecessor, George Dodson, said the scheme was not a new idea but one that has been used in the federal supply system for years.

Whether it can be used in service contracts, however, is "questionable," according to Puckorius, who said he won't release the request for proposal (RFP) until he "is satisfied" the bidding scheme will work in evaluating service contracts.

"Suppliers will be grouped for the schedule in accordance with the type of service they provide, the regions they serve, and so forth. Only then will we talk about benchmarking discounts," he explained.

Unless the program proves too burdensome from the administrative standpoint, Puckorius wants to go ahead with it.

"We are in the final stages of preparing a request for proposal to industry, and one of the features is still discount benchmarking," he said.

"However, before releasing the RFP, we want to be sure of two things – first, that it is a realistic appraiser of criteria, and second, that the administrative workload arising from the criteria we have established doesn't make the program too difficult to administer."

Puckorius estimated the proposal will be released before Aug. 1.

As for Infonet, GSA's plan calls for shortening the company's one-year contract extension to six months, with an accompanying 5% increase in rates for the balance of the contract.

Miti to Consolidate DP Groups, Underwrites Development of LSI

By Molly Upton
Of the CW Staff

TOKYO – Japan's Ministry of International Trade and Industry (Miti) plans to consolidate from three to two the number of computer manufacturing conglomerates in efforts to compete with IBM's future system.

In addition, Miti intends to integrate Nippon Telegraph and Telephone Public Corp.'s (NTT) efforts to develop high-speed, large-scale integrated (LSI) circuits with its own plans for future large computer series, according to a recent *EDP Japan Report* (EDP/JR), a newsletter published by International Data Corp. Japan.

The two emerging groups that will work on the large-scale machines will be comprised of Fujitsu-Hitachi-Mitsubishi and NEC-Toshiba, according to the report, with Oki Electric Industry Co. excluded because of its lack of experience with large machines.

EDP/JR cited reports Miti plans to have Oki specialize in peripherals and terminals.

Miti plans financial subsidies for the development efforts of the two groups as well as for the LSI work.

NTT has already begun a three-year development program including a 64K bit/chip memory device and chips for communications gear. The project is being undertaken with aid from Fujitsu, Hitachi and Nippon Electric, the report indicated.

Previously, the six Japanese makers formed three groups to concentrate on development of computers to compete with the IBM 370 series. Nippon Electric Co. linked with Tokyo Shibaura Electric Co. (Toshiba) while Oki Electric joined with Mitsubishi Electric.

Hitachi and Fujitsu also joined forces and have introduced the latest of their M series machines designed to compete with the 370/158 and the 158 II, a model with core memory designed for the Japanese market.

Hitachi so far has introduced the M-180 and the recent M-170, and Fujitsu has the M-190 and recent M-160. These models were developed with the aid of government subsidies, but each firm plans additional models which will not receive subsidies, the report said.

These include Fujitsu's plan for a machine to compete with the 370/168 II and Hitachi's plan for one comparable with the 145.

In addition, the two firms plan to announce a V series of medium- to small-scale computers consisting of three models by the middle of 1976.

The NEC-Toshiba group has unveiled the Acos Series 77 System 500, which is in the same price range as the 370/145, but which the manufacturers claim has twice as much cost/performance.

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Datacomm/76 Sets the Date

NEW ORLEANS – Datacomm/76, featuring exhibits of hardware, software and services in the data communications area, will be held Feb. 16-18 at the Rivergate Convention Center here.

The annual national conference and exposition will also feature a program oriented toward data communications users of all levels of expertise, according to Morris Edwards, program chairman and editor of *The Data Communications User* magazine, sponsor of the show.

"We recognize that in this developing community, there are those just getting their feet wet in data communications as well as a large body of very advanced users," Edwards said.

"Therefore, our program and format will run the gamut from the most basic tutorial presentations to the most sophisticated applications in all 17 areas where data communications is being applied today."

Honeywell Revamps Marketing Force

WALTHAM, Mass. – Honeywell, Inc. has revamped its U.S. commercial computer marketing operations.

The realignment is designed to strengthen the firm's field sales and systems force and streamline its marketing support functions, according to Richard R. Douglas, vice-president of Honeywell Information Systems' Data Processing Operations.

The move, scheduled to be operational Sept. 1, is seen by some observers as an attempt to bolster sagging earnings by adding more emphasis to the Series 60 and minicomputer lines.

Four area operations are being consolidated into three: Eastern Operations, headed by Vice-President Russell G. Henderson, Western Operations under Vice-President William B. Patton and National Accounts Operations under newly named Vice-President Douglas A. Davidson.

The National Accounts sector will handle national accounts, minis and small systems as well as the New England area.

As a result of the consolidation, about 100 sales people will be added to the field force, the firm said.

A new Marketing Operations organization is being formed under the direction of John P. Morgridge, also a new vice-president, to offer unified support in product marketing, industry marketing, marketing education, communications and marketing planning.

Douglas said the new organization is made possible by the "unification of our previous product offerings into a marketing thrust centered on Series 60."

"The organization also allows us to focus on our renewed emphasis in minisystems marketing, a reinforced thrust on markets in key industries and the expansion of our New Business Offices to serve the first-time and small-scale systems users," he said.

Centronics Data, Distributor Lock Horns in Court

HUDSON, N.H. – Centronics Data Computer Corp. has been busy tending to its European distribution scheme following a hassle with its nonexclusive distributor, Core Computer Related Equipment GmbH and Core Computer Related Equipment Ltd.

The latest round involves actions by Centronics against the distributor in answer to a $10 million suit filed in New York by Core.

Centronics has announced it is setting up its own subsidiaries in Britain, W. Germany and France and that an injunction obtained by Core to prevent Centronics from doing business with certain West German customers has been lifted.

Distributor Agreement

Core filed suit against Centronics seeking compensatory damages of $2.5 million on grounds that the company allegedly breeched the distributor agreement.

Core also requested $7.5 million in punitive damages.

A Centronics spokesman labeled the actions by Core "totally spurious, without merit."

Centronics has instituted actions in England and Germany to obtain court orders which would preserve and freeze all assets of Core Computer Related Equipment GmbH and Core Computer Related Equipment Ltd. pending the outcome of actions to recover the sum owed Centronics, which is in excess of $1.8 million.

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Xerox Net Reflects Market Exit

STAMFORD, Conn. – Xerox Corp.'s exit from the computer business was reflected in an $84.4 million charge against second-quarter earnings to cover the estimated loss from discontinuing its computer mainframe manufacturing and marketing operations over the next 12 to 18 months.

The special charge included the estimated operating loss Xerox expects from computer operations in this year's second half, the firm said.

Chairman C. Peter McColough said he expects computer operations to show a loss of about $44 million for all 1975. The firm lost $13 million in this area during the first half, compared with a loss of $8.8 million during the same 1974 period.

With the charge, Xerox's second-quarter earnings dropped to $4.1 million or 5 cents a share compared with the year-earlier $87.5 million or $1.10 a share.

Without the charge, Xerox would have earned $88.5 million or $1.12 a share in the 1975 second quarter.

Half-Year Earnings Drop

For the six months, Xerox's earnings dropped almost 48% to $86.7 million or $1.09 a share compared with $165.8 million or $2.09 a share in the year-ago period.

Revenue from continuing operations rose more than 19% to $1.97 billion compared with $1.65 billion. Earnings from continuing operations rose more than 5% to $184 million or $2.32 a share from $174.5 million or $2.20 a share.

During the second quarter, continuing operations produced record earnings of $96.1 million, up 6% from $90.7 million in the same 1974 period. Operating revenues reached a record $1.25 billion, up 19% from $865 million in the year-ago period.

McColough cited inflation rates coupled with recession as strong limiting factors on business growth. Profits were further constrained in the quarter by higher interest expenses required to finance investments in rental equipment, in plan equipment and in inventories, he said.

Eliminating the computer operating losses will not prevent earnings in the third and fourth quarters from slipping below those of the year-ago periods, McColough said.

The firm expects a "modest decline" in earnings from 1974 in continuing operations, he added, citing uncertain business conditions on a worldwide basis.

The volume of copies produced continued strong during the period but placements of new machines remained soft, particularly in the U.S., he added.

At Kennedy

Expanded Product Line Aids Growth

By Nancy French
Of the CW Staff

ALTADENA, Calif. – Kennedy Co., a tape drive manufacturer here that "stayed a $3-million company for a long time because it didn't have the kind of products people wanted to buy," changed that in 1972 with the introduction of its 9000 series synchronous tape drive.

Three years and several models later, it had become a $10-million company and expects to increase business by another $5 million in tape drives alone next year, according to Russ Bartholomew, vice-president of marketing.

A company that learned its lesson the hard way, Kennedy will soon expand its product line to include higher speed tape drives as well as other peripheral equipment, Bartholomew said.

"The low-speed tape drive market is no longer growing at its previous pace," he said, "so to increase business we have to do two things: build bigger, faster tape drives compatible with the midi range of computers and move into other peripheral gear," he explained.

While declining to say what that other gear would be, prototype models of a disk system and a chain printer were observed in the company's engineering division on a recent visit here.

Tape is by no means a dying business, Bartholomew said. "It's still the most important medium for most applications where you're dealing with large volumes of data. And tape is interchangeable between computer systems, and that's another important advantage," he pointed out.

Offering a wider range of equipment to its customers also will allow Kennedy to give customers price advantages it presently cannot give, he explained.

"If a customer wants 100 tape drives and 100 disk drives, for example, he would prefer to combine the order and buy both from the same manufacturer at the 200-unit price."

Kennedy has worked around that problem to a certain extent by putting together package deals with disk and printer suppliers, Bartholomew said.

A small but important part of Kennedy's business is its Series 4000 1/4-in. tape cartridge drives, according to Bartholomew.

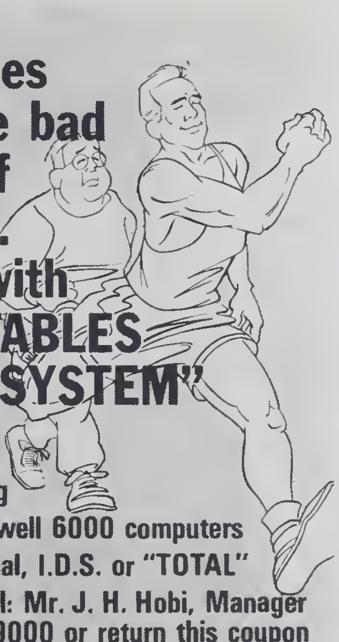
"For a while we thought the interest generated by introduction of the floppy disks was going to kill our cartridge business," he said.

"Before floppies came on the scene, we were selling about 100 cartridge systems a month. Last year, cartridge business dropped to about 10 a month," he said.

"Customers were buying evaluation units and nothing else," he said. "Recently we've been a big surge back to the cartridge, and sales are back up to the previous level because the floppy disks have not shown themselves to be a very reliable medium," he said.

Price is an important factor in OEM sales but, according to Bartholomew, the company does not sell tape drives on the basis "of price alone."

"In 1972 we evaluated the market, and decided that you just can't compete if price is your only feature. You have to take care of your OEM customers, give them support and solve their problems. Sometimes you actually develop a better rapport with a customer when problems come up," he said.



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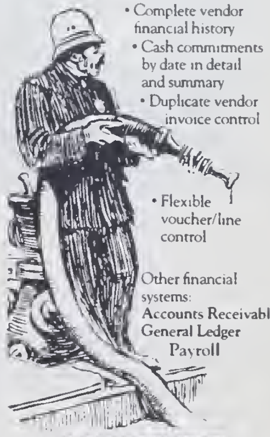

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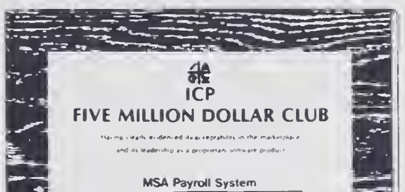

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Honeywell Six-Month Earnings Down 51.2%

MINNEAPOLIS – Honeywell, Inc.'s second-quarter operating income dropped 48% and six-month earnings were off 51.2% from those in the year-ago periods.

The second-quarter results, however, were stronger than those in the preceding first quarter, the firm noted.

Honeywell's computer operations had a small profit at the operating level in the second quarter. "This was an improvement over the first quarter of 1975, and we continue to expect this part of our business to show a year-end profit," said President Edson W. Spencer.

Rental and service revenues from computer business were up 14% to $198.9 million in the second quarter and 12% to $384.7 million for the six months, he added.

"Purchase revenues lagged behind year-earlier figures for the six months, but total revenues in the computer business are somewhat ahead of a year ago on quarterly and six-month comparisons," he said.

Net bookings of computer equipment in the quarter equaled those in the record fourth quarter of 1974, with the Series 60 continuing to be an increasingly greater part of total bookings.

"Level 62 has shown particularly strong acceptance over the last three months. Backlogs increased approximately 10% in the second quarter and are ahead of June 1974," he said.

Quarter Revenues Rise

During the quarter, revenues rose to $683.4 million compared with $655.2 million in the year-ago period.

Earnings, including a $1.2 million special credit, dropped to $11.8 million or 50 cents a share compared with $20.4 million or 91 cents a share in the year-ago quarter when there was a $25,000 special charge.

Earnings from 1974 are restated to reflect a change in accounting for certain hardware, engineering and product development costs.

During the six months, Honeywell's revenues climbed to $1.2 billion compared with $1.24 billion in the year-ago period.

Earnings dropped to $17.9 million or 66 cents a share, including $1.2 million in special credits, compared with $36.7 million or $1.65 a share in the same 1974 period, when there was a $67,000 special credit.

The firm's stronger second-quarter performance compared with the first quarter "resulted largely from improvements in our computer operations and benefits from asset management and productivity programs throughout the company," Spencer said.

Honeywell reduced short-term borrowing significantly in the second quarter, he said, and the monthly rate of net interest expense is running less than last year, he added.

Honeywell's employee count at the end of the six months was 86,278, a reduction of 12,539 persons from the same period last year, he remarked.

Spencer cited the depressed economy, noting that although there are indications the reduced demand for its residential and Micro Switch products has bottomed out, it is too early to tell when an upturn in new orders will begin.

But CCI Earnings Drop

Communications Firms' Revenues Rise

Four out of five communications equipment makers reported increased earnings for their most recent periods, and all saw revenues rise.

Computer Communications, Inc.'s (CCI) third-quarter earnings dropped to $133,786 or 6 cents a share, including a $67,000 tax credit, compared with $171,544 or 7 cents a share in the same period last year when the tax credit was $85,000.

Revenues rose to $1.2 million compared with $1.19 million in the same 1974 quarter.

Earnings also dropped in the nine months to $88,329 or 4 cents a share, including a $44,000 tax credit, compared with $416,622 or 18 cents a share when there was a $210,000 tax credit in the 1974 period.

President Raymond E. High attributed the reduced income to a 16% increase in the firm's technical and marketing staff during the year, higher interest costs and the trend toward long-term contracts rather than purchases.

General Datacomm Results Up

At General Datacomm Industries, Inc., both earnings and revenues were up for the six months ended March 31.

The firm earned $424,523 or 30 cents a share, including a $186,474 tax credit, compared with $264,960 or 18 cents a share during the same restated 1974 period, when there was a $127,180 tax credit.

Revenues at General Datacomm grew to $6.5 million compared with $4.8 million in the year-ago period.

For the quarter ended March 31, Comten, Inc.'s earnings reached $54,000 or 2 cents a share, including a $25,000 tax credit, compared with $3,000 in the year-ago period, of which $1,000 stemmed from a tax credit.

Revenues grew to $3.5 million from $2.3 in the same period last year.

At Codex Corp., revenues and income rose for both the second quarter and six months ended March 31.

During the quarter, earnings edged up to $1.1 million or 73 cents a share compared with $1 million or 71 cents a share in the year-ago period, when there was a $496,320 tax credit.

Quarterly revenues rose to $6.2 million compared with $3.9 million in the same 1974 period.

For the six months, Codex earnings also grew, without benefit of tax credit, to $2.2 million or $1.45 a share compared with $1.9 million or $1.27 a share, including an $882,360 tax credit in the same period last year.

Six-month revenue at Codex rose to $12.3 million compared with $7.2 million last year.

Sales more than doubled to $9.2 million compared with $4.5 million in the same period.

Leases also doubled to almost $2.1 million compared with $891,365, while leases treated as sales declined to $1 million from $1.7 million last year.

President Arthur Carr called results most encouraging.

Milgo Electronic Corp.'s revenues and earnings for the second quarter and six months also rose.

Quarterly earnings jumped to $1.2 million or 73 cents a share compared with $653,000 or 39 cents a share in the year-ago period. Revenues jumped to $10.6 million compared with $6.6 million.

During the six months, Milgo's earnings grew to $2.4 million or $1.44 a share compared with $1.4 million or 83 cents a share in the same period last year.

Milgo's six-month revenues reached $20.6 million compared with $13.6 million a year ago.

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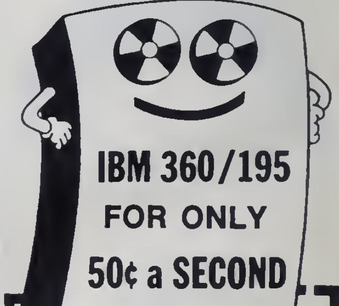

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Earnings Reports

NUCLEAR DATA
Three Months Ended May 31

	1975	1974
Shr Ernd	$.22	$.32
Revenue	3,515,823	5,049,364
Tax Cred	84,000	88,000
Earnings	a188,162	271,533

a-Includes gain of $36,000 on sale of a plant.

ASTROCOM
Six Months Ended June 30

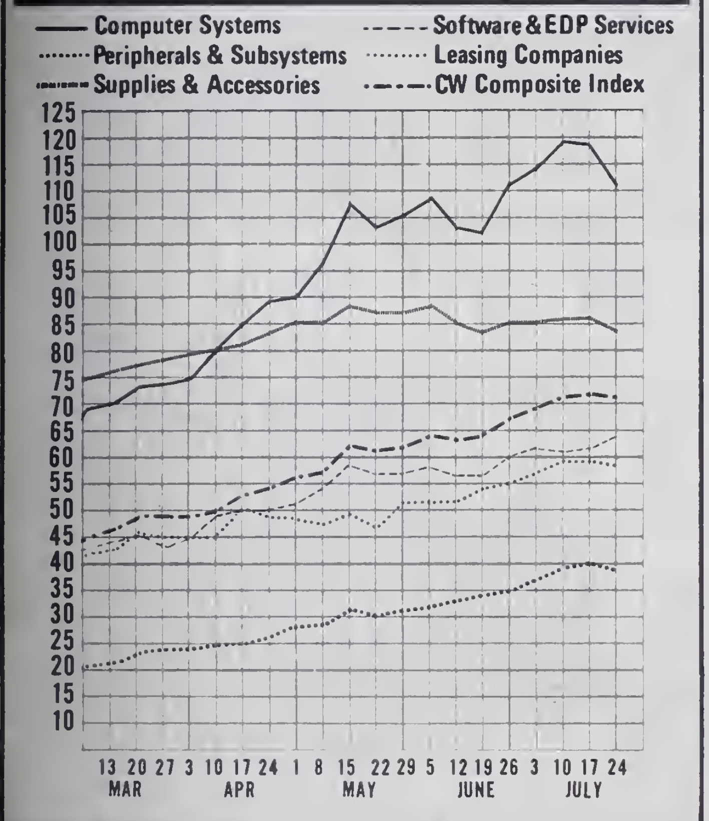
	1975	1974
Shr Ernd	$.10	.....
Revenue	736,505	$760,508
Earnings	67,706	(7,541)

HONEYWELL
Three Months Ended June 30

	1975 (000)	a1974 (000)
Shr Ernd	$.61	$1.06
Revenue	680,130	654,526
Spec Item	1,190	(25)
Earnings	11,805	20,398
6 Mo Shr	.92	1.91
Revenue	1,282,289	1,239,557
Spec Cred	1,190	67
Earnings	17,891	36,661

a-Restated for accounting change for certain houseware engineering and product development costs.

COMPUTERWORLD Computer Stocks Trading Indexes



ELECTRONIC ENGINEERING OF CALIFORNIA
Three Months Ended June 30

	1975	1974
Shr Ernd	$.47	$.48
Revenue	4,496,000	5,033,000
Earnings	286,000	295,000
6 Mo Shr	.93	.95
Revenue	8,618,000	9,367,000
Earnings	566,000	581,000

IBM
Three Months Ended June 30

	1975 (000)	1974 (000)
Shr Ernd	$3.14	$3.28
Revenue	3,496,332	3,260,038
Earnings	468,770	482,564
6 Mo Shr	6.09	6.22
Revenue	6,768,330	6,261,778
Earnings	905,993	913,827

TRW
Three Months Ended June 30

	1975 (000)	a1974 (000)
Shr Ernd	$.79	$.79
Revenue	667,100	640,900
Earnings	28,100	27,900
6 Mo Shr	1.27	1.31
Revenue	1,275,900	1,208,500
Earnings	45,700	46,100

a-Restated to reflect Lifo method of inventory valuation.

NCR
Three Months Ended June 20

	1975	1974
Shr Ernd	$.73	$.81
Revenue	516,520,000	477,256,000
Earnings	18,472,000	19,847,000
6 Mo Shr	1.32	1.32
Revenue	995,407,000	864,509,000
Earnings	32,769,000	31,901,000

PIONEER SYSTEMS
Six Months Ended May 31

	1975	a1974
Revenue	$23,566,000	$21,769,000
Disc Op	.....	(85,000)
Loss	634,000	1,053,000

a-Restated to reflect discontinued operations and accounting change of a subsidiary.

NATIONAL SEMICONDUCTOR
Year Ended May 31

	1975	1974
Shr Ernd	$1.34	$1.33
Revenue	235,457,000	213,398,000
Earnings	16,748,000	16,372,000
3 Mo Shr	.33	.41
Revenue	57,160,000	60,379,000
Earnings	4,295,000	5,165,000

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Northern Regional Manager
Robert Ziegel
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Mike Burman
COMPUTERWORLD
797 Washington Street
Newton, Mass. 02160
Phone: (617) 965-5800
Telex: USA-92-2529

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Computerworld Stock Trading Summary

CLOSING PRICES WEONESOAY, JULY 23, 1975

All statistics compiled, computed and formatted by
TRADE★QUOTES, INC.
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COMPUTER SYSTEMS

EXCH		PRICE 1975 RANGE (1)	CLOSE JUL 23 1975	WEEK NET CHNGE	WEEK PCT CHNGE
N	8URROUGHS CORP	62-109	100 3/8	-5 1/8	-4.8
O	COMPUTER AUTOMATION	2- 10	8 1/2	-1 3/8	-13.9
N	CONTROL OATA CORP	11- 23	18 3/8	-1 3/8	-6.9
N	DATA GENERAL CORP	10- 38	31 1/8	-5 1/2	-15.0
O	OATAPOINT CORP	6- 26	24	0	0.0
O	OIGITAL COMP CONTROL	1- 4	3	- 1/4	-7.6
N	OIGITAL EOUIPMENT	46-122	111 1/2	-7 7/8	-6.5
N	ELECTRONIC ASSOC.	2- 3	3	+ 1/8	+4.3
A	ELECTRONIC FNGINEER.	5- 10	8 7/8	-1 1/8	-11.2
N	FOX8ORO	23- 42	37	-2 3/8	-6.0
O	GENERAL AUTOMATION	6- 14	12	- 1/2	-4.0
O	GRI COMPUTER CORP	1- 1	5/8	+ 1/8	+25.0
N	HEWLETT-PACKARO CO	58-120	110 5/8	-5 7/8	-5.0
N	HONEYWELL INC	22- 40	32	-3 1/4	-9.2
N	I8M	158-224	193	-11 5/8	-5.6
O	MEMOREX	1- 10	9 3/8	- 1/8	-1.3
O	MICROOATA CORP	2- 6	5 1/4	- 1/2	-8.6
O	MODULAR COMPUTER SYS	5- 19	16 1/4	-1 3/4	-9.7
N	NCR	15- 39	31 1/8	-1 3/4	-5.3
O	PRIME COMPUTER INC	2- 6	5	-1	-16.6
N	PERKIN-ELMER	16- 30	26	-2	-7.1
N	RAYTHEON CO	26- 59	51 1/2	-3 3/4	-6.7
N	SINGER COMPANY	10- 17	15	- 5/8	-4.0
N	SPERRY RANO	26- 49	43 3/4	-2 1/2	-5.4
A	SYSTEMS ENG. LA8S	1- 5	3 3/4	- 1/4	-6.2
O	ULTIMACC SYSTEMS INC	1- 6	6 5/8	- 7/8	-11.6
N	VARIAN ASSOCIATES	7- 18	15 7/8	+ 5/8	+4.0
N	WANG LA8S.	7- 17	13 7/8	-2 1/8	-13.2
N	XEROX CORP	51- 86	60 1/2	-8 3/4	-12.6

LEASING COMPANIES

EXCH		PRICE 1975 RANGE (1)	CLOSE JUL 23 1975	WEEK NET CHNGE	WEEK PCT CHNGE
O	COMOISCO INC	1- 5	4 1/8	- 3/8	-8.3
A	COMMERCE GROUP CORP	2- 4	2 7/8	- 1/8	-4.1
A	COMPUTER INVSTRS GRP	1- 2	1	- 1/8	-11.1
M	OATRONIC RENTAL	1- 1	5/8	0	0.0
A	OCL INC	1- 1	1/2	0	0.0
N	DPF INC	3- 6	5 1/4	0	0.0
O	EOP RESOURCES	2- 2	2	0	0.0
A	GRANITE MGT	1- 5	4 3/8	+ 1/4	+6.0
A	GREYHOUNO COMPUTER	2- 3	3 1/8	+ 1/8	+4.1
A	ITEL	3- 9	7 3/8	-1 5/R	-18.0
N	LEASCO CORP	4- 8	8 1/4	+1 7/8	+29.4
O	LEASPAC CORP	1- 1	1/4	0	0.0
O	LECTRO MGT INC	1- 1	1/8	0	0.0
O	NRG INC	1- 4	2 7/8	- 3/4	-20.6
A	PIONEER TEX CORP	2- 7	5 1/2	-1	-15.3
A	ROCKWOOO COMPUTER	1- 1	5/8	0	0.0
N	U.S. LEASING	9- 14	12	-1	-7.6

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-8ALT-WASH
L=NATIONAL; M=MIOWEST; O=OVER-THE-COUNTER
O-T-C PRICES ARE 8IO PRICES AS OF 3 P.M. OR LAST 8IO
(1) TO NEAREST OOLLAR

SOFTWARE & EOP SERVICES

EXCH		PRICE 1975 RANGE (1)	CLOSE JUL 23 1975	WEEK NET CHNGE	WEEK PCT CHNGE
O	AOVANCEO COMP TECH	1- 1	7/8	+ 1/8	+16.6
A	APPLIEO OATA RES.	1- 10	2 3/8	- 1/8	-5.0
N	AUTOMATIC OATA PROC	29- 65	61 1/2	-2 3/4	-4.2
O	8RANOON APPLIEO SYST	1- 1	1/4	0	0.0
O	CENTRAL OATA SYSTEMS	0- 0	5 1/2	0	0.0
O	COMPUTER OIMENSIONS	2- 6	4 1/2	0	0.0
O	COMP ELECTION SYSTMS	3- 6	4 1/2	0	0.0
O	COMPUTER HORIZONS	1- 1	3/4	0	0.0
O	COMPUTER NETWORK	1- 3	3	+ 1/8	+4.3
N	COMPUTER SCIENCES	2- 6	5 1/2	- 1/R	-2.2
O	COMPUTER TASK GROUP	1- 1	5/8	0	0.0
O	COMPUTER USAGE	2- 4	2 1/4	- 1/4	-10.0
O	COMSHARE	3- 4	3 1/4	- 1/8	-3.7
O	OATATA8	1- 1	1 1/4	0	0.0
A	ELECT COMP PROG	1- 1	1/4	0	0.0
N	ELECTRONIC OATA SYS.	12- 28	21 5/8	-2 1/8	-8.9
O	INFONATIONAL INC	1- 1	1/8	0	0.0
O	IPS COMPUTER MARKET.	1- 1	5/8	+ 1/8	+25.0
O	KEANE ASSOCIATES	2- 3	2 1/4	+ 1/8	+5.8
O	KEYOATA CORP	2- 3	2 3/4	0	0.0
O	LOGICON	3- 5	4	0	0.0
A	MANAGEMENT OATA	1- 3	2 1/8	- 1/8	-5.5
O	NATIONAL CSS INC	6- 14	10	-1 1/2	-13.0
O	NATIONAL COMPUTER CO	1- 1	1/8	0	0.0
A	ON LINE SYSTEMS INC	8- 17	16 1/2	- 1/2	-2.9
N	PLANNING RESEARCH	2- 6	4 3/8	- 1/2	-10.2
O	PROGRAMMING & SYS	1- 1	3/4	0	0.0
O	RAPIOATA INC	2- 5	4 1/4	- 1/4	-5.5
O	REYNOLOS & PEYNOLO	11- 24	16 1/2	- 1/2	-2.9
O	SCIENTIFIC COMPUTERS	1- 1	1	0	0.0
O	SIMPLICITY COMPUTER	1- 1	5/8	+ 3/8	+150.0
O	TYMSHARE INC	7- 21	17 7/8	-2 3/8	-11.7
A	URS SYSTEMS	2- 4	3 7/8	+ 1/4	+6.8
N	WYLY CORP	2- 4	4 1/8	0	0.0

PERIPHERALS & SUBSYSTEMS

EXCH		PRICE 1975 RANGE (1)	CLOSE JUL 23 1975	WEEK NET CHNGE	WEEK PCT CHNGE
N	AODRESSOGRAPH-MULT	4- 9	7 5/8	- 5/8	-7.5
O	AOVANCEO MEMORY SYS	1- 7	5 1/4	-1 1/8	-17.6
N	AMPEX CORP	3- 7	6 3/4	- 3/8	-5.2
O	ANDERSON JACO8SON	1- 3	2 7/8	- 1/8	-4.1
O	8EEHIVE MEDICAL ELEC	1- 5	4 1/2	0	0.0
A	8OLT,BERANEK & NEW	5- 13	10 3/8	-1 1/8	-9.7
N	8UNKER-RAMO	4- 8	7 1/8	- 5/8	-8.0
A	CALCOMP	4- 7	5 7/8	- 5/8	-9.6
O	CAM8RIOGE MEMORIES	3- 5	4 1/2	0	0.0
N	CENTRONICS OATA COMP	7- 25	20	-2 7/8	-12.5
O	COOEX CORP	15- 38	37	+ 1/4	+0.6
O	COGNITRONICS	1- 2	1 1/2	- 1/8	-7.6
O	COMPUTER COMMUN.	1- 2	1 1/2	+ 1/8	+9.0
O	COMPUTER CONSOLES	3- 7	5 1/4	+ 1/4	+5.0
A	COMPUTER EQUIPMENT	1- 2	2	+ 1/8	+6.6
O	COMPUTER MACHINERY	1- 2	1 7/8	- 3/8	-16.6
O	COMPUTER TRANSCEIVER	1- 2	1 3/8	- 1/8	-8.3
O	COMTEN	2- 5	4 3/8	- 1/4	-5.4
N	CONRAC CORP	12- 23	20 5/8	- 3/8	-1.7
O	OATA ACCESS SYSTEMS	1- 3	2 1/4	0	0.0
O	OATA 100	5- 16	12 3/8	- 7/8	-6.6
A	OATA PROOUCTS CORP	2- 6	5	- 1/2	-9.0
O	DATA TECHNOLOGY	1- 3	1 1/2	- 1/4	-14.2
O	DATUM INC	1- 2	1 7/8	+ 1/2	+36.3
O	DECISION DATA COMPUT	4- 7	5 1/8	- 5/8	-10.8
O	OELTA OATA SYSTEMS	1- 1	1/4	0	0.0
O	DI/AN CONTROLS	1- 1	1 1/2	0	0.0
N	ELECTRONIC M & M	1- 3	2 3/8	- 3/8	-13.6
O	FA8RI-TEK	1- 1	1 3/8	0	0.0
O	GENERAL COMPUTER SYS	1- 2	2	+ 1/2	+33.3
N	HAZFLTINE CORP	3- 6	4 3/4	- 3/4	-13.6
N	HARRIS CORP	18- 28	25	- 3/4	-2.9
A	INCOTERM CORP	3- 12	11	- 1/4	-2.2
O	INFOREX INC	2- 5	3 5/8	- 3/8	-9.3
O	INFORMATION INTL INC	8- 14	13 1/2	- 1/8	-0.9
A	LUNOY ELECTRONICS	3- 3	2 7/8	0	0.0
O	MANAGEMENT ASSIST	1- 1	5/R	0	0.0
A	MILGO ELECTRONICS	8- 24	21 3/4	+ 3/4	+3.5
N	MOHAWK OATA SCI	1- 5	3	- 1/4	-7.6
O	OPTICAL SCANNING	1- 3	2 3/4	0	0.0
O	PENRIL CORP	2- 2	1 3/4	- 1/8	-6.6
O	PERTEC CORP	2- 8	6 1/R	- 7/8	-12.5
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	PRECISION INST.	1- 1	1	0	0.0
O	QUANTOR CORP	2- 6	5 1/4	- 1/8	-2.3
O	RECOGNITION EQUIP	2- 9	7 3/8	-1 3/8	-15.7
N	SANOERS ASSOCIATES	3- 11	8 3/4	-1 1/8	-11.3
O	SCAN OATA	1- 3	2 1/2	- 1/4	-9.0
O	STORAGE TECHNOLOGY	6- 17	15 1/8	-1 3/8	-8.3
O	SYCOR INC	5- 15	14	- 3/4	-5.0
O	T 8AR INC	3- 6	5 3/4	- 1/4	-4.1
O	TALLY CORP.	1- 5	3 1/2	+ 1/2	+16.6
O	TEC INC	1- 4	3 1/2	+ 1/2	+16.6
N	TEKTRONIX INC	18- 41	38	-3	-7.3
N	TELEX	1- 3	2 5/8	0	0.0
O	WANGCO INC	4- 9	7 1/4	- 7/8	-10.7
O	WILTEK INC	1- 4	3	0	0.0

SUPPLIES & ACCESSORIES

EXCH		PRICE 1975 RANGE (1)	CLOSE JUL 23 1975	WEEK NET CHNGE	WEEK PCT CHNGE
O	8ALTIMORE 8US FORMS	4- 5	4 1/2	0	0.0
A	8ARRY WRIGHT	5- 7	6 3/4	0	0.0
O	CY8ERMATICS INC	1- 1	5/8	0	0.0
A	OATA OOCUMENTS	29- 42	33 1/8	- 7/8	-2.5
O	DUPLEX PROOUCTS INC	12- 25	19 7/8	- 1/2	-2.4
N	ENNIS 8US. FORMS	5- 7	5 7/8	+ 1/8	+2.1
O	GRAHAM MAGNETICS	5- 10	8 1/2	-1 1/4	-12.8
O	GRAPHIC CONTROLS	8- 21	13 7/8	- 3/4	-5.1
N	3M COMPANY	43- 68	57 1/2	-3 5/8	-5.9
O	MOORE CORP LTO	39- 51	50 1/4	- 3/4	-1.4
N	NASHUA CORP	15- 22	16	- 7/8	-5.1
O	STANOARO REGISTER	11- 20	19	+ 1/4	+1.3
O	TA8 PROOUCTS CO	4- 9	6 3/4	+ 1/4	+3.8
N	UARCO	17- 24	22	- 1/2	-2.2
O	VANIER GRAPHICS CORP	4- 7	5 1/4	0	0.0
A	WA8ASH MAGNETICS	3- 5	4 5/8	- 1/8	-2.6
N	WALLACE 8US FORMS	15- 25	21 1/2	-1	-4.4

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